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SOME BEAUTIFUL INDIAN TREES

Noble Amherstia

Amherstia nobilis

Frontispiece

SOME BEAUTIFUL INDIAN TREES

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BY

ETHELBERT BLATTER

AND

WALTER SAMUEL MILLARD

SECOND EDITION
REVISED BY
WILLIAM T. STEARN

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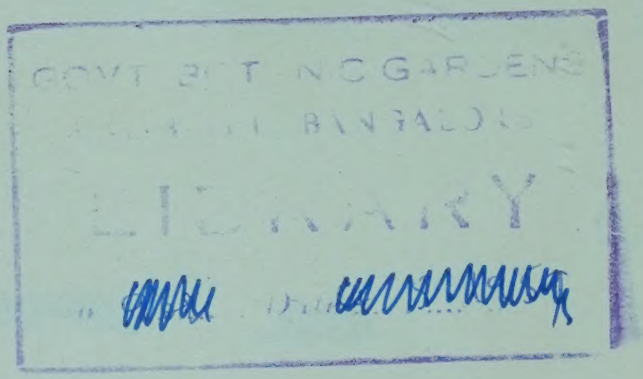

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TO THE MEMORY OF

SISTER MARY CHIONIA

OF ALL SAINTS, BOMBAY

† 14TH AUGUST 1932

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† 26TH MAY 1934

AND

WALTER SAMUEL MILLARD

FOR MANY YEARS A GENEROUS

SUPPORTER OF THF BOMBAY

NATURAL HISTORY SOCIETY

AND AN EDITOR OF

ITS JOURNAL

† 24TH MARCH 1952

ALL OF WHOM UNSELFISHLY COLLABORATED

IN THE PRODUCTION OF THIS BOOK

BUT DID NOT LIVE TO SEE THE

TASK COMPLETED

THIS ENLARGED EDITION IS

GRATEFULLY DEDICATED

BY THE

BOMBAY NATURAL

HISTORY SOCIETY

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INTRODUCTION

This book deals with some of the most beautiful flowering trees which are to be seen in India. Most of them grow wild in India and have been introduced from there into other tropical countries. Some, however, have been brought from other tropical countries to India. It thus includes a number of trees familiar to flower-lovers in all warm countries and will, it is hoped, be of use and interest not only in India but the tropics generally. It consists of revised and partly rewritten articles which appeared originally in the *Journal of the Bombay Natural History Society*, volumes **33** (1929) to **39** (1936). These were prompted by many enquiries as to the correct names of trees so conspicuous when in flower, which revealed the need for a modern book about them with illustrations in colour. To ascertain their names is not always easy unless one is botanically minded and has available a good library of botanical works. Many people, however, lack the time and facilities for such research and are unable to visit botanical gardens where correctly labelled specimens of these trees may be found. This book accordingly gives short descriptions in popular language of some of the more conspicuous trees, together with coloured and black-and-white illustrations. It aims to be of service to those who wish to learn not only the names of these beautiful trees but also something about their history, cultivation and uses.

The coloured plates have been reproduced from drawings of the living plants by the following artists, to all of whom our thanks are due : Miss Margaret Thacker, Miss Gwendolen Millard (Lady Kinnear), Sister Mary Chionia, Lady Douie, Mr S. H. Prater, Mrs H. Robinson and Mr H. N. Wandrekar. The help given by the late Rev. J. F. Caius, S.J., Mr Charles McCann, Mr P. M. D. Sanderson and the late Mr C. E. C. Fischer in the preparation and publication of the first edition is also gratefully

acknowledged. That edition, written in collaboration with the late Rev. Father E. Blatter and published in 1937, has long been out of print but has remained in demand. The present edition is more than a reprint of that work in a larger type. Many additions and corrections have been made to the notes on the meaning, history and derivation of the plant names, especially those relating to *Delonix*, *Kleinhovia* and *Salmalia*. A few descriptions have been slightly amended and a coloured plate of *Delonix elata*, references, synonyms, descriptions of the botanical families, a key to the genera, a short glossary and a short bibliography have been added, while bringing the nomenclature into line with the International Code of Botanical Nomenclature by taking note of research done in America, Britain, the Philippines, Malaya, the Dutch East Indies and Ceylon has necessitated a number of changes in the names employed in the first edition. The descriptions of the families represented have been taken from Dr John Hutchinson's *The Families of Flowering Plants*, *Dicotyledons* (Macmillan, London, 1926) by kind permission of the author and the publishers and are included for the benefit of students. Mr William T. Stearn, a specialist in botanical bibliography, who became acquainted with most of the trees described here while serving in India and Burma during the 1939-45 war, has kindly assisted me in the preparation of this book and most of the above-mentioned differences between the two editions are due to his enthusiastic co-operation.

W. S. M.

Tunbridge Wells
Kent, England

NOTE

Mr Millard came out to Bombay from England in 1884 as a wine-merchant, retiring to England in 1920, but remaining keenly interested until his life's end in the promotion of Indian natural history and gardening. An account of his services to the Bombay Natural History Society will be found in the Society's *Journal*, **50**, 698, 910-913 (1952). He introduced many good plants to Bombay and formed gardens there which were examples of good planning and cultivation. In this book he has made some of the results of his experience permanently available. At the age of eighty-four he felt unable to produce a new edition unaided and asked me to revise and extend its botanical and bibliographical material, a task I undertook gladly, for my stay in India and Burma had made me well aware of the book's value as a simple guide to the commoner showy trees of those countries. This revision was done in 1948. Unfortunately circumstances outside our control, notably the loss of original illustrations and blocks during the war, have delayed publication. It is a matter of sorrow that Mr Millard died before the final printing. The delay has, however, made possible the incorporation of further references and of information which has become available since 1948.

W. T. S.

British Museum (Natural History)
London

THE SPLENDID AMHERSTIA

AMHERSTIA NOBILIS *Wallich*, Pl. Asiaticae Rar. 1, 1, t. 1. 2 (1829); Hooker f., Fl. Brit. India, **2**, 272 (1878).

This is perhaps the most beautiful of all flowering trees. The large graceful sprays of vermilion and yellow flowers drooping from every branch, set in the deep green foliage, present an aspect of astonishing loveliness scarcely equalled by any tree in the world. Very remarkable and striking are the long hanging rich red or purplish clusters in which the young leaves appear. It is a leguminous plant, and belongs to the family *Caesalpiniaceae*. The name *Amherstia* is in honour of Countess Amherst and her daughter, Lady Amherst, promoters of Indian botany : *nobilis*, on account of the exquisite beauty of the flowers.

Description.—A moderate-sized tree 30 to 40 ft. high, much like the Asoka (*Saraca indica*) in general appearance when not in bloom. The stout trunk is covered with thick, uneven, dark ashy-grey bark. The spreading branches are overlaid with dense dark green foliage. The young shoots and leaves are pendulous and downy. The leaves, 1 to 1½ ft. long, are composed of 6 to 8 pairs of opposite leaflets. The leaflets, 6 to 12 in. long by 1 to 1½ in. wide, are distantly arranged ; in shape oblong with almost parallel sides, narrowing slightly to the base and suddenly tapering off to a fine point at the apex. They are smooth and dark green above, paler and softly hairy below. At the base of the leaf-stalk there are two leaf-like lance-shaped and sharply pointed stipules, 1 to 1½ in. long, which fall off soon after the leaf develops.

The flowers are arranged in very large candelabra-like racemes which arise from the axils of the leaves, and frequently attain 3 ft. in length. The reddish branches of the racemes support from 20 to 26 beautiful flowers. The individual flower stalks together with the large leaf-like bracts below the calyx are intensely red. The calyx is tubular at base, then divides into 4 spreading sepals

a little shorter than the bracts. The corolla has 5 petals, 3 conspicuous, 2 minute. The large standard is 3 in. long by 2 in. at its widest part, reversedly heart-shaped with rounded lobes and toothed margins. In colour it is red with a splash of white between the lobes and a roundish yellow spot in the centre. The wing petals are like the standard but much narrower, spreading and reflexed. The two keel petals are small. There are 10 stamens, a short free upper one and 9 united basally by their filaments, 5 anthers on long filaments alternating with 4 almost sessile anthers. The anthers are large and dark green in colour. Ovary is flat and densely hairy. The fruit is a broad pod.

Flowering.—The tree flowers during the greater part of the year, but chiefly from January to March. The flowers last only two or three days.

Distribution.—It is indigenous in Tenasserim, southern Burma, but is so rare that it seems to have been recorded only twice in a wild state. Wallich, who discovered it in 1824, knew Amherstia only as a cultivated tree growing in a monastery garden near Martaban. In 1865 the Rev. C. Parish saw a single wild tree by the Yoonzalin river, a tributary of the lower Salween (c.f. *Journal R. Asiatic Soc. Bengal*, **34**, No. 3, p. 145 ; 1865). In 1927 Mr R. N. Parker found a few trees in the Mergui district near the Tenasserim river ; here the local Karens called it *natthami* (daughter of the spirit). Its Burmese name is *thawka*.

Uses.—Cultivated as an ornamental tree in the moister parts of Burma, Southern India, Bengal and Ceylon.

Gardening.—The tree is somewhat difficult to cultivate, being delicate when young and requiring a rich soil and a warm, moist, equable climate. It may be raised from seed in pots or baskets, but can best be propagated by layering in the hot season and planting out during the rains. It is successfully cultivated in Ceylon, but seldom ripens its seeds there (Troup).

The seeds are also exceedingly difficult to obtain in Burma, and propagation is principally by layering. In Bombay there are a few good specimens growing with some protection from the midday sun.

1. A flowering spray of *Amherstia nobilis*.

2. A tree of *Amherstia nobilis.*

We have taken the liberty of quoting the following extract from a book published in 1935, *Paxton and the Bachelor Duke*, by Violet Markham, in which it is related how the sixth Duke of Devonshire brought back from Calcutta in 1837 two plants of *Amherstia nobilis*. One died on the voyage home and although the other one flourished at Chatsworth it never flowered.

"Twelve years later, in 1849, they had the mortification of seeing a plant of *Amherstia* sent by Lord Hardinge, then Governor General of India, to Mrs Lawrence, of Ealing Park, Middlesex, flowered by this lady when it was only eleven feet high.

"Ten years previously, Dr Wallich had accompanied the British Envoy on a tour in Burmah. Their business took them up the River Salven [*i.e.* Salween] in order to examine the teak forests of that area. On his return, Dr Wallich inflamed the imagination of all botanists and gardeners by his account of a new and marvellous tree with splendid geranium coloured flowers found by him in the garden of a ruined monastery on the Salven River near the town of Martaban. Handfuls of blossoms were scattered as offerings in the caves before the images of Buddha. Dr Wallich was able to bring back a specimen of this tree to the Calcutta Botanic Garden. It was given the name of *Amherstia nobilis* (Splendid Amherstia) and by a happy coincidence it flowered for the first time in March, 1836, as Gibson landed in India."

There is a large specimen of this tree in one of the stove houses at Kew; Mr C. P. Raffil, late Assistant Curator, writes: "The Kew plant was presented by Mrs (afterwards Lady) Lawrence in 1854. Its height is about 28 ft., but it has to be kept down to the height of the roof by pruning and would no doubt become much higher if there was room for it to extend. It generally flowers here in April or May."

Standardised plant name, U.S.A.—Flame Amherstia.

THE VARIEGATED BAUHINIA

BAUHINIA VARIEGATA *Linnaeus*, Sp. Pl. 1, 375 (1753); Hooker f., Fl. Brit. India, 2, 284 (1878).

The name *Bauhinia* was given in honour of the celebrated herbalists Jean Bauhin (1541-1613) and his brother Gaspard (Caspar) Bauhin (1560-1624), "the two-lobed leaves or two as it were growing from the same base recalling the noble pair of brothers," as Linnaeus remarked. The genus belongs to the family *Caesalpiniaceae* (*Leguminosae*).

Description.—A medium-sized tree with dark brown, nearly smooth bark. The young shoots are covered with a brown pubescence. The leaves, which are shed during the cold weather, are 4 to 6 in. long, as broad or broader than long, with a median cleft reaching from $\frac{1}{4}$ to $\frac{1}{3}$ the way down into the blunted lobes. When young they are minutely hairy but with age this character is lost except along the nerves and their axils. Their texture is slightly leathery, the base is usually deeply heart-shaped and there are 11 to 15 nerves; the stalks vary from 1 to $1\frac{1}{2}$ in. long. The flowers are large, fragrant, and may be either white or purplish, appearing when the tree is leafless; they are disposed in short, few-flowered, grey pubescent racemes at the ends of the branches or in the axils of the leaves; the flower stalks are short or absent with bracts and minute bracteoles which are slightly hairy and deltoid in shape. Calyx tube slender $\frac{1}{2}$ to 1 in. long, the limb spathe-like, as long as the tube and 5-toothed at the apex, softly grey-haired. Petals 2 to $2\frac{1}{2}$ in. long, obovate, with long rather broad claws, all white or 4 petals pale-purple and the fifth darker with purple veins. Stamens 5 fertile, no staminodes. Ovary softly hairy along the sutures, long-stalked; style long; stigma head-like. Pods 6 to 12 by $\frac{3}{4}$ to 1 in., hard, flat, dehiscent on a hairless stipe 1 in. long. Seeds 10 to 15.

This beautiful tree has flowers of varied colours, pink,

Variegated Bauhinia

Bauhinia variegata

Mauve form and white form

white and mauve splashed with purple. The white flowering form (*candida*) is also common and is very striking with a yellow splash at the base of one or more petals. These trees flower from December to March or April. Mr C. M. Tembe, Superintendent of H.H. The Maharaja Holkar's garden at Indore, the Manik Bagh, says : " This tree is planted largely there in gardens and avenues for ornamental purposes."

Distribution.—Found wild in the sub-Himalayan tract from the Indus eastwards, Assam, Burma, Chota Nagpur, Central Provinces, Western Peninsula. Cultivated largely. Wild also in China.

Gardening.—Often cultivated in gardens and will sometimes flower in its second year as a shrub. It thrives in a variety of soils, but delights in high well-drained land. It is very tender and easily affected by low temperatures. No particular care in tillage or manuring is necessary, but a better bloom is secured if some attention is given to these. Cuttings root with difficulty.

Flowering, leaf-shedding and fruiting.—The leaves commence falling in November to December, and the tree is leafless or nearly so by March ; the new leaves appear in April and May. The large pink to purple or white flowers appear from February to April, chiefly on the upper leafless branches, the lower branches often being still in leaf. The flowers are fragrant and are visited by bees, by whose agency pollination is effected. The pods form rapidly, ripening in May and June (Northern India) ; they are 6 to 12 by $\frac{7}{10}$ to 1 in., hard and flat, with 10 to 15 seeds, and dehisce for the most part on the tree, scattering the seeds. The seeds are $\frac{1}{2}$ to $\frac{3}{4}$ by $\frac{1}{2}$ to $\frac{7}{10}$ in., nearly circular, flat, brown, with a somewhat coriaceous testa, 70 to 100 weighing 1 oz. ; they germinate readily and show a high percentage of fertility, which is retained to some extent for at least a year (Troup).

Natural reproduction.—The seeds, which are scattered before the beginning of the monsoon, germinate readily when the rains begin, and germinating seeds may be found in quantity round the trees. But unless the seed happens to become buried in earth and débris, or is

sheltered from the sun, most if not all of the young plants may die off owing to the drying up of the radicle if exposed to the sun, while birds and insects also cause a good deal of mortality by eating off the radicles. The most favourable condition for the establishment of reproduction appears to be the presence of loose porous well-drained soil, in which in the first place the seed has a chance of becoming covered with earth, and in the second place the seedling develops sufficiently rapidly to overcome weed-growth (Troup).

Artificial reproduction.—The most successful means of raising the tree artificially is by sowing in lines in which the soil has been well loosened, followed by regular weeding and loosening of the soil. Unless regular watering can be carried out, transplanting is difficult except in the case of small plants during the first rains. The seed should be sown in May in drills 9 to 10 in. apart ; the young plants usually appear in 4 to 10 days, and may be transplanted while still comparatively small during the first rains. Trees planted for ornament may be kept a second year in the nursery, but regular watering is necessary in the dry season following transplanting ; in this case either the seedlings should be pricked out in the nursery during the first rains or the drills should be at least 12 in. apart, and the seedlings should be thinned out where necessary (Troup).

Economic value.—The plant is of value for decorative purposes.

The tree yields a gum with the properties of Cherry gum. The bark is used in tanning and dyeing ; it yields a fibre.

The leaves are made into cigarette covers.

The seeds are said to yield an oil.

The wood is grey and moderately hard, with irregular masses of darker and harder wood in the centre. It is hard and serviceable, but seldom of large size ; it weighs 33-48 lb. per cubic foot. It is used for making agricultural implements and for fuel.

Domestic uses.—The leaves, the flowers, the flower-buds, and the young pods are eaten as a vegetable ; the flower-buds are often pickled.

Medicinal properties and uses.—Almost every part of the plant is used medicinally in India.

Sacred uses.—The tree is often seen on Buddhist sculptures.

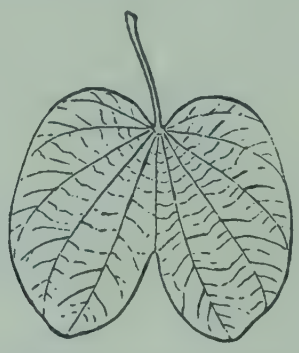
Vernacular names.—Almora : Keorab ; *Bengal* : Bidul, Kovidara, Lalkanchan, Raktakanchan, Vagakangchan, Yugapatra ; *Berae* : Kachnag, Kachnar, Kanchan ; *Bhumij* : Kandol, Kundol ; *Bombay* : Kanaraj, Kanchan, Kovidara ; *Burma* : Bwaycheng, Bwechin ; *Canarese* : Arisinantige, Ayata, Bilikanchivala, Bilikanjivala, Irkubalitu, Kanjivala, Karalabhogi, Kempukanjivala, Kempumandara, Mandara, Ulipe ; *Central Provinces* : Kachnar ; *Dehra Dun* : Kachnar ; *English* : Variegated Mountain Ebony ; *French* : Arbre de Saint Thomas, Bauhinie panachée ; *Hindi* : Barial, Gurial, Gwiar, Kachnar, Kandan, Kaniar, Khairwal, Khwairaal, Koliar, Kural, Padrian ; *Jaunsar* : Gorias ; *Khond* : Kopu ; *Kolami* : Buj, Burunga, Juruju, Singya ; *Konkani* : Kanchan ; *Kotra* : Kachnal ; *Kumaon* : Guiral, Kuiral ; *Lambadi* : Jhinjero ; *Lepcha* : Rha ; *Malayalam* : Kovidaram, Suvannamandaram, Unna ; *Marathi* : Kanchan, Raktakanchan, Thaur ; *Mechi* : Kurmang ; *Melghat* : Champa ; *Mundari* : Burju, Buruju, Jantai ; *Nepal* : Taki ; *Nimar* : Kachnar ; *Sanskrit* : Ashmantaka, Champavidala, Kanchana, Kovidara, Uddalaka, Yugapatraka ; *Santali* : Jhinjir, Jingya ; *Saora* : Boda, Rovilara ; *Tamil* : Mandarai, Segappumandarai, Semmandarai, Vellaippuvatti ; *Telugu* : Bodanta, Devakanjanamu, Kanjanamu, Mandara, Mandari ; *Urdu* : Kachnal ; *Uriya* : Boroda, Kanjoni, Kosonaro, Rongakonjono.

Standardised plant name, U.S.A.—Buddhist Bauhinia.

The Variegated Bauhinia can easily be mistaken for another beautiful tree often grown in Indian gardens, the Purple Bauhinia (*Bauhinia purpurea*), described on the next page.

THE PURPLE BAUHINIA

BAUHINIA PURPUREA *Linnaeus*, Sp. Pl. **1**, 375 (1753); Hooker, f., Fl. Brit. India, **2**, 284 (1878).



Description.—A medium-sized tree with nearly ashy to dark brown bark, leafless during the cold season; young parts clothed with brown pubescence. Leaves 3 to 6 in. long, rather longer than broad, cleft about half-way down into 2 pointed or rounded lobes, very minutely hairy beneath when young, base usually heart-shaped, 9 to 11 nerved; leaf-stalks 1 to 1½ in. long. Flowers large, rose, purple, disposed in few-flowered panicles at the ends of the branches; the panicles are covered with a brown tomentum, stalks ⅓ to ½ in. long, stout and covered with a powdery substance; bracts and bracteoles small, tomentose, deltoid. Calyx tomentose, tube $\frac{3}{10}$ to ⅖ in. long, the limb twice as long as the tube usually splitting into 2 reflexed segments, one irregular margined, the other 3-toothed. Petals 1½ to 2 in. long, oblanceolate, long-clawed, spreading-veined. Stamens usually 3 fertile, the others reduced to antherless filaments. Ovary downy, long-stalked; style long; stigma large and oblique. Pod 6 to 10 by ⅗ to ⅗ in. on a tomentose stalk, ⅗ to 1 in. long, linear, flat, pointed, greenish tinged with purple till ripe, breaking up late. Seeds 12 to 15, almost round, flattened, ½ in. in diameter, dark brown, smooth.

It grows sparingly throughout India and China and is cultivated in most parts of India.

Flowering and fruiting.—The terminal panicled racemes of large purple, deep-rose to lilac flowers appear amongst

3. The Purple Bauhinia (*Bauhinia purpurea*). A branch with flower and fruit.

T. D. Shrinivasan

4. The Purple Bauhinia (*Bauhinia purpurea*). A tree full of young fruits in the Indian Botanic Garden, Calcutta.

the foliage from September to December. The flowers are very fragrant, and are visited by numerous bees, by whose agency pollination is effected. The pods form rapidly, some attaining a fair length while the tree is still in flower ; they ripen from January to March, and

are then greenish-purple, 6 to 12 by $\frac{7}{10}$ to 1 in., flat, fairly thick, pointed, slightly falcate, with coriaceous valves, containing 10 to 15 seeds. The seeds are brown, compressed, $\frac{3}{5}$ by $\frac{1}{2}$ in. They germinate readily and have a high percentage of fertility, which they retain unimpaired for at least one year ; tests at Dehra Dun with seed kept for 14 months showed a fertility of 100 per cent. The pods dehisce on the tree during the hot season, scattering the seeds (Troup).

Natural reproduction.—The seeds germinate readily at the beginning of the rains, when numerous young seedlings may be found in the neighbourhood of seed-bearers. Where germination takes place on the surface of the ground, however, much mortality occurs owing to the drying up of the radicle if exposed to the sun. The survival of the seedlings is greatly facilitated if the seed becomes buried in loose earth before germination and the roots of the young plant are not exposed (Troup).

Artificial reproduction.—Experiments at Dehra Dun have shown that the best results are attained by line sowings kept regularly weeded ; irrigation also has a marked effect on the growth. The seedlings are somewhat sensitive to transplanting, which has to be done with care. The seed should be sown in the nursery in April or May in drills 9 to 10 in. apart, and covered to a depth of about $\frac{1}{4}$ in., regular watering and weeding being carried out. The seedlings appear in about 4 to 10 days, and can be transplanted while still of small size during the first rains. Transplanting with unpruned stem and roots should not be attempted during the second rains unless regular watering is possible for some time. A certain amount of success has been attained by transplanting after pruning the stem and tap-root down to 2 and 9 in. respectively, but this checks the growth severely for a time (Troup).

Economic value.—The tree yields a gum. The bark is used for dyeing and tanning ; it yields a fibre. The leaves are given to cattle as fodder.

The wood is pinkish-white, turning dark brown on exposure, moderately hard, weighs 40 to 50 lb. per cubic foot ; used for the making of agricultural implements and for building purposes.

Domestic uses.—The flowers are used as a potherb in curries, and they are also made into pickles.

Medicinal properties and uses.—The root is tonic and carminative, the flowers laxative, and the bark astringent. A decoction of the bark is recommended as a useful wash in ulcers.

The bark or root and the flowers, mixed with rice

water, are used as a maturant for boils and abscesses. The Mundas apply the root on cuts and bruises.

The bark of the underground root is poisonous even in a small quantity.

Vernacular names.—Bengal : Devakanchan, Koiral, Raktakanchan ; *Bhil* : Kanchana, Kenchna ; *Bombay* : Atmatti, Devakunchun, Ragtakanchan ; *Burma* : Mahahlegani ; *Canarese* : Basavanapadu, Kanchivala, Kanjivala, Kempukanjivala, Kempumandara, Sarul, Ulipe ; *Dehra Dun* : Khairwal ; *Garhwal* : Guiral ; *Gond* : Kodwari ; *Hindi* : Gairal, Kaliar, Kandan, Kaniar, Karar, Khairwal, Koilari, Koinar, Koliar, Sona ; *Ho* : Sing'a ; *Kharwar* : Koinar ; *Khond* : Kopu, Soveri ; *Kolami* : Buruju ; *Koya* : Godetta ; *Kurku* : Koliari ; *Lepcha* : Kachik ; *Lohardugga* : Koinar ; *Malayalam* : Suvannamandaram ; *Mal Paharia* : Kundrau ; *Marathi* : Atmatti, Devakanchana, Ragtachandan, Raktakanchan ; *Mundari* : Singara ; *Nepal* : Khwairalo ; *Punjab* : Karalli, Karar, Koiral, Kolar ; *Reddi* : Godugura ; *Saharanpur* : Khairwalpapri ; *Sanskrit* : Raktapushpakovidara, Vanaraja ; *Santali* : Singyara, Sinhara ; *Saora* : Boda ; *Tagalog* : Alibanban ; *Tamil* : Kalavilaichi, Mandarai, Nilattiruvatti, Periavatti, Segappumandarai ; *Telugu* : Bodanta, Devakanjanamu, Kanjanamu, Peddare ; *Tharu* : Koilara ; *Uriya* : Boroda, Debokanjoro, Kosonaro, Sono.

Standardised plant name, U.S.A.—Purple Bauhinia.

THE FLAME OF THE FOREST

BUTEA MONOSPERMA (*Lam.*) *Taubert* in Engler and Prantl, Pflanzenfam. 3, iii, 366 (1894).

Syn. *Erythrina monosperma* Lamarck, Encycl. Méth. Bot. **2**, 391 (1788)—*Butea frondosa* Roxburgh, Pl. Coromandel, **1**, 22, t. 21 (1795); Hooker f., Fl. Brit. India, **2**, 194 (1876)—*Plaso monosperma* (Lam.) O. Kuntze, Revisio Gen. **1**, 202 (1891).

The genus is named after John Stuart (1713-92), 3rd Earl of Bute, munificent patron of botany. *Monosperma* means "one-seeded."

This is the tree we consider the true "Flame of the Forest." In parts of the country where these trees abound, such as the forests of the Western Ghats and Central India, their massed crowns of bright orange flowers seen in the glitter of the sunlight suggest a forest in flames, so brilliant, so vivid is their colouring.

Description.—An erect tree growing from 20 to 40 ft. in height, with a crooked trunk and irregular branches. Its bark is ash-coloured and rough, though the younger portions of the tree are downy. The leaf is trifoliolate. It is composed or made up of three leaflets, leathery in texture. The old leaves are hairless above and finely silky below; this silky covering gives the leaves a peculiar greyish appearance when seen from a distance. The network of veins stands out very conspicuously beneath the leaf. The terminal leaflet is a blunt oval in shape. It is described as obovate, or rounded at the apex and

Flame of the Forest

Butea monosperma

narrowing to a wedge at its base. It measures from 4 to 8 in. in length and is about as broad as long. The lateral leaflets are broader at the base and more rounded. They measure from 4 to 6 by 3 to 4 in. The main stalk of the leaf is quite 4 to 6 in. in length ; those of the leaflets are about a quarter of an inch long.

Grouped in threes along a velvety, dark olive-green stalk, the handsome flowers grow in great profusion in stiff racemes, about 6 in. long. The individual stalks of the flowers are about twice as long as the calyx, which is deep velvety, olive-green externally and clothed with silken hairs within. The rich dark tones of the stalks and the calices present a striking contrast to the flaming orange colouring of the petals. The outer or under surface of the petals takes on a salmon-pink tone due to a delicate covering of silvery hairs. Five petals are apparent, *i.e.* a standard petal, about an inch broad, two smaller wing petals and a much curved, beak-shaped keel which is really formed by the fusion of two petals. The stamens are practically enclosed within the keel. There are 10 of them, 9 united in a bunch and 1 free.

The pod when young is pale green. When ripe, it fades to a pale yellowish-brown or grey. It carries a

silvery white sheen. It is extremely flat and thin except at the apex where a slight thickening indicates the position of its single seed. A thickening is also seen along the margins.

The leaves begin to fall at the end of November or during December. By the end of January some trees are leafless, or nearly so. Others retain their leaves, especially

on the lower branches, during the flowering season, up to the end of March. New leaves appear in April or early May and are of a delicate fresh-green colour.

Flowering season.—The flower buds are blackish and appear on the bare branches in January, and from the end of that month to the end of March the trees announce the approach of the hot weather by bursting into a blaze of flaming orange flowers, presenting a gorgeous sight. When in flower, the tree is either entirely leafless or there are some leaves on the lower branches. The flowers cover chiefly the upper part of the tree. Flowering continues, according to locality, up to the end of April. The time of flowering is greatly influenced by seasonal conditions. In dry seasons the flowers appear earlier than usual.

The pale-green flat pods develop very quickly and in April the leafless trees, covered with green pods, give the impression of being in full foliage.

Varieties.—In Vol. **6**, p. 107 (1891), of the *Journal of the Bombay Natural History Society*, H. T. Ommanney records a variety of *Butea monosperma* which he observed at Ghodra in the Panch Mahals. The flowers were a pale yellow, with the bases of the petals primrose-yellow shading to a creamy tint on the edges and on the reverse sides. Col. C. E. Luard describes a variety seen by him in Manpur Pargana, Central Indian Agency, which produced golden-yellow flowers, their colouring like that of the sunflower (*Journ. Bombay Natural History Society*, **26**, p. 26 ; 1918). A yellow variety is also known from Amraoti, Berar. Seeds of this variety, sent by Major D. O. Morris to Mr W. S. Millard in Bombay, were planted ; one tree is now growing in the Ladies' Gymkhana, Malabar Hill, Bombay.

In *Indian Forester*, **65**, p. 506 (1939), Mr K. P. Sagreiya has named canary yellow and bright orange variants, *B. lutea* and *B. aurantea*.

Distribution.—Common throughout the greater part of India and Burma. In the outer Himalaya it ascends to about 3000 ft., in Southern India to 4000 ft. In the most arid regions it is rare or absent. In open grass lands the tree is very typical and is often found gregarious.

Gardening.—The long pod has only one seed near the top. On germination the seed remains in the pod, which opens at the tip and allows the young shoot and root to emerge. The cotyledons remain attached to the seedling for a considerable time. Growth is greatly stimulated by weeding and irrigation, and Troup is of opinion that the former is even more important than the latter. The thick, long tap-root is often devoured by pigs, rats and porcupines. The roots have a wonderful power of recovery and any part not destroyed by animals will send up new shoots.

Propagated by seeds. Thrives in black-cotton soil, also in salt lands and in water-logged places.

Economic value.—The brilliant orange flowers which appear before the leaves make the plant a very attractive one for decorative purposes.

A valuable tree for recovering salt lands, and next to *Schleichera trijuga* the most important one for the development of the lac insect.

A ruby-coloured gum exudes from the tree, either naturally or from artificial scars. It is largely used in medicine and also in tanning and dyeing.

The young roots yield a fibre which is made into ropes and native sandals. The inner bark also yields a strong fibre which is used for rough cordage, for caulking boats and for paper-making.

The leaves serve as plates, and are also used for making umbrellas. They are used as manure.

A clear bright oil is extracted from the seeds in small quantities.

An infusion of the flowers dyes cotton, previously prepared with alum, a bright yellow, which may be changed by an alkali into deep orange.

The wood generally resembles teak in appearance. In Gujerat and in the Central Province of Ceylon it is extensively employed for house-building purposes. In the Punjab it is used for well-curbs, piles, and water scoops of native wells ; it is also used for gunpowder charcoal. Well seasoned, it weighs from 30 to 40 lb. per cubic foot.

Domestic uses.—The root of young trees, 1 to 2 years old, is baked and eaten by Mundari children ; when eaten raw, it causes giddiness. Pinned together with thorns, the large leaflets are used rurally as plates for food. The leaves are fodder for buffaloes and elephants.

Medicinal properties and uses.—The gum is used as an external astringent.

The bark and the seed are given for snake-bite, and the ash of a young branch is prescribed in combination with other drugs in cases of scorpion-sting, but, as shown experimentally by Caius and Mhaskar, they are all equally useless.

Popular beliefs.—The tree is sacred to the Moon, and is said to have sprung from the feather of a falcon imbued with the Soma, the beverage of the gods. It is supposed to be thus imbued with the immortalising Soma. It is much employed in the Hindu ceremonies connected with the blessing of calves to ensure their providing good milkers.

The dry twigs are used to feed the sacred fire. The wood is sacrificial, and is frequently mentioned in the Vedas ; from it are made sacred utensils and the staff of the Brahmin which is placed in his hand as part of the thread ceremony.

When, the last tuft of hair being removed, a Brahmin boy becomes a Sadhu, he must eat from a " palas " leaf. This is trifoliolate ; the middle leaflet is supposed to represent Vishnu, the left Brahma and the right Shiva.

The red flowers are offered to the gods, and in the spring festivals they serve to give a temporary yellow dye to the clothes of their votaries. They are likened by the Buddhists to penitents dressed in red ; and Amir Khusru, the Turkoman poet, likened them to a lion's claws stained with blood.

Vernacular names.—*Annam* : Cay gieng gieng ; *Baigas* : Pharsa ; *Bandelkhand* : Chalcha ; *Bengal* : Kinaka, Palas, Palasa, Paras ; *Berar* : Palas ; *Betul* : Palas ; *Bihar* : Faras, Paras ; *Bombay* : Khakara, Khakharo, Palasa ; *Burma* : Pauk, Pouk, Pouk-pin ; *Canarese* : Brahmavikraha, Muttaga, Muttala, Muttuga, Palasa ; *Central Provinces* : Chinta, Chiula, Purohapalas ; *Cutch* : Khakar, Palas ; *Deccan* : Palas, Pullas, Tesu ; *English* : Bastard Teak, Flame

C. McCann

5. The Flame of the Forest (*Butea monosperma*).
A flowering branch.

C. McCann

6. The Flame of the Forest (*Butea monosperma*).
General appearance.

British Museum (Natural History)

7. The Climbing Palas (*Butea superba*) as figured in an eighteenth-century Indian drawing made under Roxburgh's supervision.

C. McCann

8. A flowering branch of the Indian Laburnum (*Cassia fistula*).

of the Forest ; *French* : Butée feuillue, Butée touffue, Erythrine monosperme ; *Gond* : Murr ; *Gujerati* : Kakria, Khakara, Khakda, Khakhado, Khakhar, Khakharo, Palasso ; *Hindi* : Chalcha, Chichra, Desukajhad, Dhak, Kakria, Kankrei, Palasa, Parasa, Pursha, Tesu ; *Indo-China* : Chea tran, Chiang, Gieng gieng, Tu khoang ; *Kadir* : Mukkappuyam ; *Kolami* : Morud, Murut ; *Kumaon* : Dhak ; *Kurku* : Murr, Pharsa ; *Lambadi* : Dagodar ; *Lepcha* : Lahokung ; *Malayalam* : Brahmavriksham, Kimshukam, Mukkappuyam, Muriku, Palasi, Palasinjamata, Plaso, Puppalasi, Shamata ; *Marathi* : Kakracha, Palas, Paras, Phalas, Phulas ; *Matheran* : Khakra, Pulas ; *Mechi* : Palashu ; *Mundari* : Muruddaru ; *Nepal* : Bulyettra, Palasi ; *Nimar* : Palas ; *Persian* : Darakhte-palah, Palah ; *Portuguese* : Favas de engenho ; *Punjab* : Chachra, Pla, Sanura ; *Sanskrit* : Bijasneha, Bramhopadapa, Karaka, Krimighna, Lakshataru, Palasha, Raktapushpaka, Tripatraka ; *Santali* : Murup ; *Sinhalese* : Gaskeala, Kaliya, Kalukeale ; *Tamil* : Kattumurukku, Murukku, Palasu, Parasu, Pungu, Purasu, Vallai, Vallaippurasu ; *Telugu* : Kimsukamu, Modugu, Palasamu, Tellamoduga, Togarumoduga, Vatapodhamu ; *Tulu* : Palasa ; *Urdu* : Palashpapra ; *Uriya* : Kinjuko, Polas, Polaso, Porasu.

Standardised plant name, U.S.A.—Bengal Kino.

Butea Koenig ex Roxburgh

Four or five species of trees or woody vines of India and China, with deep scarlet papilionaceous flowers in racemes, and trifioliolate leaves. The belong to the family *Papilionaceae* (*Leguminosae*).

THE CLIMBING PALAS

BUTEA SUPERBA *Roxburgh*, Pl. Coromandel, 1, 23, t. 22 (1795); Hooker f., Fl. Brit. India, 2, 195 (1876).

A gigantic woody climber with a stem as thick as a man's leg, with very large, long, pointed leaflets. The leaflets are much larger than those of *B. monosperma*, usually 12 to 18 in. in length, attaining quite 20 in. in young plants. The climber is crowded, when leafless, with gorgeous orange-scarlet flowers. The flowers again are much larger than those of *B. monosperma* and are borne on stalks three times the length of the calyx.

Flowers.—The climber flowers between March and April. The pods ripen in June and July, and the leaves are shed between February and May. The pods are like those of *B. frondosa*.

Distribution.—Central and Southern India, Burma.

Uses.—The roots and also the young branches afford a strong and useful fibre.

The leaves are regarded as a valuable fodder.

The tree yields a gum.

The root, the bark and flowers are all prescribed for the treatment of snake-bite; the flowers are recommended for scorpion-sting; but no part of the plant is an antidote to either snake or scorpion venom (Caius and Mhaskar).

Vernacular names.—*Bengal*: Latapalash; *Berar*: Belia palas, Palasvel; *Bombay*: Palasavela, Palasi; *Burma*: Poukgnwe; *Cambodia*: Char; *Canarese*: Muttuginaballi; *Deccan*: Bel palas; *English*: Climbing Palas; *Gond*: Samur; *Gujerati*: Velkhakar; *Kharwar*: Dorang; *Kolami*: Morud; *Koya*: Modugaige; *Kurku*: Tunang; *Lao*: Mai kwou krena; *Marathi*: Beltivas, Palasavela, Palasvel, Yelparas; *Monghyr*: Chihunt; *Mundari*: Laramurud, Narimurud; *Sanskrit*: Latapalasha; *Santali*: Narimurup; *Singrampur*: Baduri; *Telugu*: Modugaige, Tigamaduga, Tigemoduga, Tivvamoduga; *Uriya*: Noi-palas, Noipolaso, Palsano, Polasonoi.

THE INDIAN LABURNUM

CASSIA FISTULA *Linnaeus*, Sp. Pl. 1, 377 (1753) ; Hooker f., Fl. Brit. India, 2, 261 (1878).
Syn. *Cathartocarpus fistula* (L.) Persoon, Syn. Pl. 1, 459 (1805).

Cassia is an old Greek name used by Dioscorides. *Fistula*, " a pipe," alludes to the long tubular fruit.

Description.—This beautiful tree is frequently planted on city roads and avenues. Laburnum Road in Bombay

derives its name from the number of Indian Laburnums planted there.

It is a more gracefully shaped tree than the European Laburnum. The Indian Laburnum is a small, upright tree which grows to a height of 20 or 30 ft. Its trunk is short, its branches slender, upright and spreading, its foliage of the deepest green. In young trees the bark is smooth and ash-coloured. In older trees it becomes rough and dark brown. The tree has a compound leaf. The pubescent or slightly downy mainstalk or rachis of the leaf, 9 to 16 in. long, bears from 4 to 8 pairs of leaflets. Those growing about the base of the rachis are broadly ovate in shape, while the leaflets nearer its tip are more oblong and blunt-ended. The leaflets grow opposite or nearly opposite one another. They are from 2 to 5 in. long and about $1\frac{1}{2}$ to $3\frac{3}{4}$ in. broad. They are smooth above and covered with fine veins, more conspicuous on the under surface of the leaflet. The tender leaves are bright green and covered below with a silvery down. The erect branches and large leaves are distinctive in the Indian Laburnum and quite unlike the feathery, mimosa-like foliage and drooping branches so usual among the Cassia trees.

Few Indian trees are more beautiful when in flower. Draped in streaming clusters of bright yellow blossoms, which hang from its branches in a golden shower, the tree suggests the European Laburnum, but it is infinitely more beautiful. Its drooping clusters of flowers are longer and the flowers themselves much larger. Each raceme or cluster is from 12 to 18 in. long. The cluster is made up of slender, thread-like stalks which hang downwards and bear a profusion of large, fragrant, yellow flowers. The stalk of a flower is from $1\frac{1}{2}$ to $2\frac{1}{4}$ in. long. It is slender, slightly hairy or quite smooth. The calyx is made of 5 tender green sepals which fold backwards on the stalk. There are 5 petals almost equal in size, almost oval in shape and very distinctly veined. They enclose 10 thread-like stamens all crowned with anthers. The 3 longest stamens are much curled and bear large, oblong anthers. There are 4 smaller median ones which are quite straight; the 3 remaining stamens are quite short and erect. Their anthers do not bear pollen. The pods,

Indian Laburnum

Cassia fistula

of which there is always a great profusion, are very conspicuous during leaf fall. They hang like so many straight pipes and have given the tree its Latin name of *fistula*. For a similar reason the Dutch, an unromantic people, called our Laburnum the " Pudding-Pipe Tree," while the Bengali refers to the pods as " Monkey Sticks." The pod is a straight cylinder. It is from a foot to 3 ft. in length, and about an inch in thickness. It is quite smooth

and dark green when young, turning dark brown and then black with age. Each pod contains from 40 to 100 oval, shining, yellowish-brown seeds embedded in a dark-coloured, sweetish pulp.

Distribution.—Common in deciduous forests throughout the greater part of India and Burma, ascending to 4000 ft. in the Himalaya ; also in Ceylon. The tree is not gregarious, but is scattered in mixed deciduous forests, often of a somewhat open type : it occurs fairly frequently in sal forest. Sometimes it approaches gregariousness in localities frequented by monkeys. It is found on a variety of geological formations and will grow on poor shallow soil, as on the dry outer slopes of the Himalaya. In climatic requirements it shows a wide range. In its natural habitat the absolute maximum shade temperature varies from 100° to 120° F., the absolute minimum from

25° to 65° F., and the normal rainfall from 20 to 120 in. or more.

Leaf-shedding, flowering and fruiting.—The tree is leafless for a very short time, or hardly at all, between March and May, the new leaves appearing in April to May; these are bright green or sometimes a beautiful rich copper colour. The long pendulous racemes of large bright yellow flowers appear chiefly with the new leaves from April to June, but it is no uncommon thing to find the tree in flower even as late as September, particularly in dry years. The long cylindrical pods develop rapidly, reaching almost full length but not full thickness by October, when they are still soft and green. By November they are full-sized but still green and unripe; they commence ripening in December and continue ripening from January till March or April. The ripe pods hang for some time on the tree, commencing to fall about April to May, continuing to fall in the following months; old pods may often be found on the trees in September or later along with the new half-grown green pods.

Like many other hard leguminous seeds, those of *Cassia fistula* take some time to germinate, some lying a whole year in the ground before doing so, even if regularly watered. Boiling the seeds for about five minutes before sowing has been found to give very good results in stimulating germination. Tests carried out at Dehra Dun showed that the seeds retain their vitality unimpaired for at least two years. It was found that seeds from pods one year old germinated more quickly than those from fresh pods, though the percentage of sound seeds in the former may be low owing to insect attacks (Troup).

Gardening.—C. fistula stands a moderate amount of shade. It is not frost-hardy, and suffered severely in the great frost of 1905 in Northern India. In the abnormal drought of 1907 and 1908, which seriously affected the forests of Oudh, it proved to be decidedly hardy. It is not readily browsed, even by goats. It coppices vigorously and produces root-suckers from a root-system which is partly superficial. As already stated, it is not exacting as regards soil, and may be found on poor shallow soils.

Natural reproduction.—The following facts have been established regarding the natural reproduction of this tree from seed :—

(1) Reproduction is effected mainly, and perhaps entirely, through the agency of animals (monkeys, jackals, bears, pigs, and possibly others), which break open the pods to eat the pulp and thus scatter the seeds or swallow and disseminate them.

(2) The seed germinates during the rainy season, some lying dormant until the second or even the third rains.

(3) Germination is favoured if the seed becomes buried, and to some extent if it is protected by a moderate growth of grass ; if the seed lies on the surface of the ground, much mortality takes place during germination owing to the destruction of the radicle by birds and insects, or to its drying up if exposed to the sun.

(4) Many seedlings perish in heavy weed-growth owing to damping off during the rains.

Artificial reproduction.—The seed germinates tardily, that kept for a year germinating more readily than fresh seed. The seed should be sown in seed-beds in drills about 10 in. apart in March or April, and regularly watered ; germination ordinarily takes place early in the rains, though some of the seed may lie dormant until the second year, germinating at different times from March onwards. Transplanting requires some care, but it can be carried out satisfactorily while the plants are still comparatively small during the first rains ; basket-planting is the most satisfactory method, the seedlings being transferred to the baskets in the first rains and planted out in the second rains (Troup).

Economic value.—The tree is very suitable for decorative purposes.

From the stem exudes a red juice which hardens into a gummy substance.

The bark is used to some extent as a tanning material in India, and for dyeing and tanning in Java.

The pulp of the pods is largely used in Bengal to flavour native tobacco.

The wood ash is used as a mordant in dyeing.

The wood is very durable ; used for tom-toms, bows, posts, agricultural implements, carts, and rice pounders, though rarely of sufficiently large size for timber ; weighs 52 to 73 lb. per cubic foot. It has been recommended for paving blocks. Sapwood large, heart-wood varying in colour from grey or yellowish-red to brick-red, extremely hard.

Domestic uses.—The flowers are largely used by the Santals as an article of food.

Medicinal properties and uses.—In Hindu medicine the pulp is used as a cathartic ; and the root is also described as a laxative, useful in fever, heart disease, retained excretions, biliousness, etc. In the Makhzan-El-Adwiya, the pulp is described as lenitive, useful for relieving thoracic obstructions and heat of blood, and is a safe aperient for children and women. Externally, it is said to be a good application for gout, rheumatism, etc. The flowers are made into a confection known as *Gul-kand* and viewed as a febrifuge. From 5 to 7 of the powdered seeds are prescribed as an emetic, and the shell of the pod, rubbed down with saffron, sugar and rose-water, in difficult parturition. In the Konkan, the juice of the young leaves is used to cure ringworm and allay the irritation caused by the application of the marking-nut juice.

The root is given as a tonic and febrifuge. It has been found to act as a strong purgative.

A poultice made of the leaves is said to relieve the chilblains which are common in Upper Sind. It has been beneficially used in facial paralysis and rheumatism when rubbed into the affected parts. Internally, it is given as a derivative in paralysis and brain affections.

The pulp of the fruit is in common use as a purgative in the South of Europe ; but is not often employed in England, except in the form of the lenitive electuary, of which it is an ingredient.

No part of the plant is an antidote to either snake or scorpion venom (Caius and Mhaskar).

By steam-distilling the finely powdered fruit of *Cassia fistula*, a dark yellow volatile oil, possessing a honey-like

odour, is obtained. The oil forms an amorphous mass at ordinary temperatures, melts at 41° C., and has a faint acid reaction. The water which distils over with the oil contains normal butyric acid.

Popular beliefs.—In Mysore stakes from the tree are fixed in the ground and worshipped.

Vernacular names.—*Arabic* : Bukbur, Chiar-schambar, Katha-ul-hind, Khiyar shambur ; *Assam* : Sonaru, Sunaru ; *Baigas* : Raella ; *Bengal* : Amultas, Bandarlati, Sonali, Sondala, Sondali, Sudali, Suvarnaka ; *Berar* : Bahala, Bahawa ; *Betul* : Amaltas ; *Bijnor* : Kitwali ; *Burma* : Gnookye, Gnooshway, Ngu ; *Cachar* : Bandolat ; *Cambodia* : Reach chhpus ; *Canarese* : Aragina, Aragvadha, Arevata, Kaki, Kakkai, Kakke, Konde, Rajataru ; *Central Provinces* : Hirojah, Jaggarwah, Karkacha, Raila ; *Chinese* : A Po Le, Koui Hoa Ts'in, Tch'ang Ko Chou ; *Deccan* : Amaltas, Bawa, Bhaya, Girmalah ; *Dehra Dun* : Kirala ; *Egypt* : Chiar schambar ; *English* : Cassia, Drumstick, Golden Shower, Indian Laburnum, Pudding-pipe, Pudding-stick, Purging Cassia, Purging Fistula ; *French* : Canéfice, Canéficier, Canificier, Casse mondée, Casse officinale, Cassier ; *Garhwal* : Simara, Sinara ; *Garo* : Sonalu ; *German* : Fistelkassie, Kassienroehrlein, Purgirkassie, Rohrkassie, Wurstroehrenbaum ; *Gond*: Jaggra, Jugarua, Kambar, Rera ; *Greek* : Glykokalamon, Kassia melaina, Melaina kassia, Syrina ; *Guam* : Cañafistula ; *Gujerat* : Balla, Garmala, Garmalo, Girmala ; *Hawaii* : Golden Shower ; *Hindi* : Amaltas, Bandarlauri, Girmalah, Hamaltas, Khyar, Paikassi, Sundaraj, Thumfur ; *Indo-China* : Bo cap muoc, Brai xiem, Krete, Sach phle ; *Italian* : Cassia ; *Java* : Tanggoeli ; *Kharwar* : Danbar, Dhanrach, Dunras ; *Khond* : Pundali ; *Kolami* : Hari ; *Konkani* : Baio, Ballo, Bavo ; *Kotra* : Chuntur ; *Kumaon* : Amaltas, Kitola, Rajbriksh ; *Kurku* : Banag, Bangru, Bhanaka-bhungru ; *Lambadi* : Ramdanda ; *Lepcha* : Sung-gyen ; *Malaya* : Sonawir ; *Malayalam* : Konna, Kritamalam, Saturangulam, Svarnnakam, Svarnaviram ; *Marathi* : Bahava, Bawa, Bhawabaya, Boya, Chimkani, Garmala, Girimala ; *Matheran* : Bahawa, Garmala ; *Mexico* : Cañafistula, Cuauhnacaztli, Honxin ; *Mundari* : Haridaru ; *Nasirabad* : Chhamkani, Chimkani ; *Nepal* : Rajbirij, Rajbriksha ; *Nimar* : Amaltas ; *North-Western Provinces* : Itola, Kitoli, Kitwali, Shimarra, Sim ; *Oudh* : Warga ; *Palamow* : Bonurlati, Bonurlauri ; *Persian* : Khiyar-chanbar, Khiyar-e-chiga ; *Philippines* : Cañafistula, Cañapistola ; *Porebunder* : Garmalo ; *Portuguese* : Canna fistula, Cassia fistula ; *Punjab* : Alash, Ali, Amaltas, Kaniar, Karangal, Kiar ; *Reddi* : Rela ; *Sanskrit* : Aragvadha, Arogyashimbi, Chaturangula, Himapushpa, Kritamala, Maharaj druma, Rajataru, Svarnabhushana, Vyadivata ; *Santali* : Mirjubaha, Nuruc', Nuruic ; *Saora* : Rella, Sonnalu ; *Sind* : Chimkani ; *Sinhalese* : Ahalla, Ahilla, Ehela ;

Spanish : Cañafistola, Caña fistula ; *Tagalog* : Ancherhan, Cañapistola, Quiñapestula ; *Tamil* : Appai, Aragoram, Irali, Iyagam, Kondrai, Madalai, Sarakkondrai ; *Telugu* : Aragvadhamu, Kolapouna, Rela, Sampakamu, Suvarnamu ; *Tulu* : Konde ; *Uran* : Sonarki ; *Urdu* : Amaltas ; *Uriya* : Sandari, Soturongulo, Sonari, Sunari ; *Visayan* : Balay, Balayong, Boloyong, Ibabao, Lombayong ; *Yemen* : Chiar schambar.

Standardised plant name, U.S.A.—Golden-shower Senna.

Cassia Linn.

Cassia is an ancient Greek name for a genus which comprises some 400 different trees, shrubs and herbs, some of them famed for the beauty and profusion of their flowers, others for their medicinal value. The genus is included in the family *Caesalpiniaceae*, which is named after the Italian botanist Andrea Cesalpino who flourished between 1519 and 1603. We propose to illustrate in colour 3 species of this genus which are noted for their showy flowers and to refer more briefly to a few others which are commonly cultivated.

We append a key which will help in distinguishing the various species of Cassia described here.

A. Bracts very small, falling off long before the flowers appear :
  1. Leaflets few, large, smooth, in distant pairs — *C. fistula.*
  2. Leaflets many, hairy, in closely approximate pairs . . . . . — *C. grandis.*

B. Bracts conspicuous, persisting till the flowers open.
  a. Leaflets 6 to 14 pairs. Racemes lateral :
    1. Leaflets pointed at the tips ; smooth . — *C. nodosa.*
    2. Leaflets rounded at the tips, hairy below — *C. javanica.*
  b. Leaflets 8 to 20 pairs. Racemes growing from the scars of the fallen leaves . . . — *C. renigera.*
  c. Leaflets 10 to 20 pairs. Racemes growing in the axils of the leaves on the young twigs of the year . . . . . — *C. Roxburghii.*
  d. Leaflets 20 to 25 pairs . . . . — *C. multijuga.*

The Cassias delight in a sunny exposure ; they are summer bloomers for the most part. Propagation is mostly by divisions and seeds, the annual species always by seeds.

Plate IV

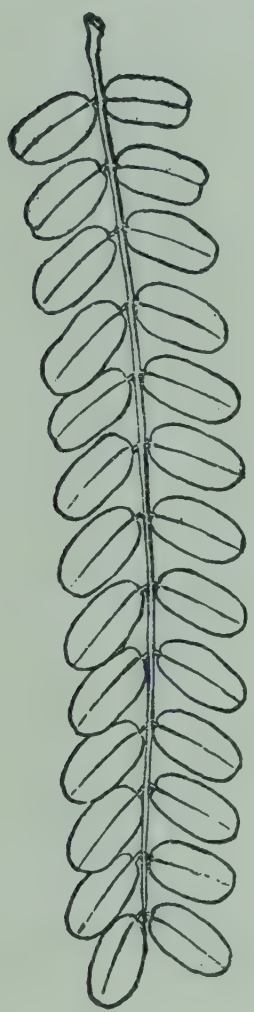
Java Cassia

Cassia javanica

THE JAVA CASSIA

CASSIA JAVANICA *Linnaeus*, Sp. Pl. 1, 379 (1753); Hooker f., Fl. Brit. India, 2, 261 (1878).

Description.—Roxburgh described this Cassia as the most beautiful he had ever seen. It is a medium-sized tree. Its straight trunk, covered with smooth, dark brown



bark, supports a spreading crown of sturdy horizontal branches and numerous drooping feathery-leaved branchlets. The leaves are from 6 to 12 in. in length. At the base of the leaf-stalk is a crescent-shaped stipule. Its lower half is narrow; the upper half is broader with a spur in a notch at its apex. A large leaf is composed of from 8 to 14 pairs of leaflets; on the smaller leaves

growing on the lateral flower-bearing branchlets there may be no more than 2 to 4 pairs. These leaflets are 1 to 2 in. in length and about half that in breadth. They are all very short-stalked, oblong-oval in shape and rounded or blunt at the tips. There is much variation in the shape of the leaflets ; mostly they are blunt at the apex but in some this character is less pronounced. In texture they are smooth and silky, the under surface being covered with a mat of downy hairs. They are quite glossless. Leaf fall commences in December, some of the leaves turning a bright yellow ; by February most of the branches are bare—their only ornament is the blackened seed pods. The soft tender green leaves come out in May together with clusters of deep pink buds. The buds are grouped in whorls at the end of short lateral branchlets. These presently opening form lovely bunches of rose-pink flowers. In its crown of tender green flowers and flower-laden branches the Java Cassia is indescribably beautiful. The distinct clusters of flowers intermingled with the foliage are a character which distinguishes the flowering of this Cassia from the Burmese Pink Cassia (*C. renigera*). In the latter the flowering branches are leafless. Except for a few leaves at the extremity they are covered with a flow of pink and white blooms in which the individual clusters are not readily discernible. In *Cassia javanica* each cluster of flowers contains about 10 blooms growing on long, slender stalks. At the base of each stalk is a leafy, dull-red heart-shaped bract. The calyx has 5 deep red sepals. The oblong petals are of a lively rose-pink, veined in deeper pink. They fade to white. The red bracts and sepals, the deep pink buds, the pink and white of the petals give the clusters a lively, variegated appearance. There are 10 bright yellow stamens. The 3 lower stamens are long and prominent. They project in a double curve, swell out markedly in the middle and then bend inwards. They are crowned with large brown anthers. The anthers on the smaller stamens are yellow. All of them are fertile. The style is green.

The pods grow from 15 to 24 in. in length ; externally

C. McCann

9. Flowers and leaves of *Cassia javanica.*

C. McCann

10. Flowers and leaves of *Cassia nodosa.*

they differ in no way from those of the Indian Laburnum (*Cassia fistula*). The only distinguishing feature is the soft sweet pulp of *C. fistula*. In a pod of the Java Cassia the space between the partitions—there are 70 to 80 of them—is filled with a spongy mass in which there is a roomy cell for a flattened seed, the size of a pea, smooth and of a shiny brown colour.

Flowering season.—The tree flowers in May and by mid-June the height of the flowering season is past and the ground below the tree is strewn with fallen petals. The seed pods ripen about February. This is another of the beautiful trees which, during the hot weather, brighten the roadsides and gardens of Bombay, where it was introduced about the year 1910. Mr H. V. Kemball was prominent in introducing it. Unfortunately the tree has not a long life.

Distribution.—A native of Sumatra and Java. Planted in the Peninsula, in Calcutta and Bombay, and probably elsewhere.

Uses.—In French Guiana it is used medicinally as a substitute for *C. fistula*.

Vernacular names.—English : Java Cassia, Javanese Cassia ; *French Guiana* : Casse-para.

Standardised plant name, U.S.A.—Appleblossom Senna.

CASSIA NODOSA *Buchanan-Hamilton* ex Roxburgh, Hortus Bengal. 31 (1814), name only, Fl. Ind. ed. alt. **2**, 236 (1832) ; Hooker f., Fl. Brit. India, **2**, 261 (1878).

The epithet *nodosa* means " full of knots," *i.e.* with prominent nodes or swellings, and refers to the 3 longer stamens of the flowers of this tree being spherically thickened at the middle. The same character occurs, however, in some other species of the genus.

As this Cassia, in common with the Java Cassia, is frequently planted on roadsides and in gardens, we give here a description which emphasises the points of distinction between these two trees which are very similar in general habit.

Cassia nodosa grows to a larger size than the Java Cassia. Like the Java Cassia, it has a crown of spreading

branches with numerous drooping feathery-leaved branchlets. The leaf is from 6 in. to a foot in length. It is composed of from 6 to 13 pairs of leaflets without an odd terminal leaflet. The base of the leaflet is oval but towards the apex it narrows and becomes almost lance-

shaped. The leaflets of the Java Cassia are blunt or rounded at the tips. Another point of distinction is the texture of the leaflets. Those of the Java Cassia are glossless, slightly downy below. They have a silky feel. The leaflets of *C. nodosa*, when full grown, are smooth and leathery in texture with a glossy upper surface. Like the Java Cassia, the flowers come out in big distinct clusters. These clusters, grouped along the branches in pairs or solitary, grow from the axils of the leaves or more usually above the scars of the fallen ones. The

flowers and buds are of the same bright pink colour and display the same tendency to fade white. They are set in whorls at the end of a short branchlet. The points of distinction are : The flower of *C. nodosa* has a velvety calyx with green sepals, in *C. javanica* the calyx is smooth and the under surface of the sepals is deep red ; the petals of the former are more sharply pointed at the tips than in the Java Cassia ; finally the leafy bracts at the base of the flower stalks are distinctly heart-shaped in *C. javanica* while in *C. nodosa* they are narrow and lance-shaped. The flowers have 10 very unequal stamens. The lower 3 are the longest, each with a distinctive globular swelling in the middle. These nodes in the middle of the stamens give the tree its name, but this character is also present in the flowers of *C. javanica* and in other Cassias. The pods are similar in both trees. Those of the Java Cassia are said to grow longer, reaching from 18 to 24 in., while the pods of *C. nodosa* are from 12 to 18 in. in length.

Flowering season.—May and June.

Distribution.—Burma, Chittagong, Malay Peninsula, China, Sumatra, Borneo.

Vernacular names.—Burma : Nguthein ; *Malay* : Busuk-busuk, Sibusuk, Turukop bumi.

THE RED CASSIA

CASSIA ROXBURGHII *De Candolle*, Prodr. **2**, 489 (1825).

Syn. *Cassia marginata* Roxburgh, Hortus Bengal. 31 (1814), name only, Fl. Ind. ed. alt. **2**, 338 (1832) ; Hooker f., Fl. Brit. India, **2**, 262 (1878), not *C. marginata* Willdenow, Enum. Horti Berol. 444 (1809).

Description.—A rather small, round-shaped tree, growing from about 15 to 20 ft. in height with slender, downward curving branches. Less robust in appearance than the Cassias previously described, the Red Cassia is uncommonly beautiful at all times, particularly when in full flower. The leaf is composed of from 10 to 20 pairs of leaflets. They are leathery, smooth above and blunt at the tips. The flowers appear in small single clusters growing from the axils of the leaves, on the young twigs

of the year. There is a great profusion of them covering the upper surfaces of the drooping branches. The petals of the flowers are terra-cotta red with fine green veins, deeper in tone on the under surfaces. The older blooms are very bright pink. The 2 lower petals of the flower are usually the largest, though the flower itself is small, the petals not being more than half an inch in length. All the stamens bear anthers. The 3 uppermost are the longest ; they protrude and curve inwards and are crowned with dark red anthers. They have no swelling in the

middle as with the stamens of *C. nodosa* and some of the other species. In the centre there are 4 much smaller stamens with bright red anthers and 2 lower stamens. These 2 are the smallest. They bear yellow anthers. The sepals are salmon pink. There are pale green bracts at the base of the flower stalks. The pods are cylindrical, 8 to 12 in. long with transverse partitions.

Flowering season.—The Red Cassia commences to flower in May, though the height of the flowering season is June, when the trees are smothered with their little red flowers. The seed pods are ripe in March and April.

Distribution.—The Red Cassia is a native of Ceylon. It was introduced into the Royal Botanic Gardens at Calcutta in 1802. It is a common tree in South India from South Arcot to Travancore and in the forests of Mysore and the Carnatic. It is not uncommon in Bombay gardens. There are a number of fine specimens

in the grounds of St George's Hospital, originally planted by the late Lt.-Col. H. P. Dimmock, I.M.S.

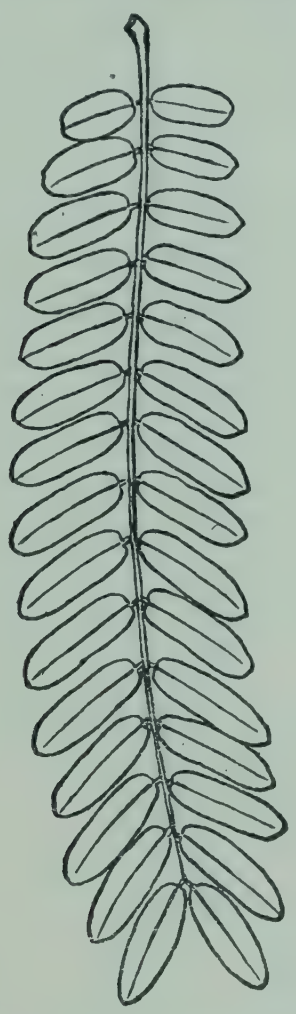
Economic value.—Heartwood light brown, very hard. The wood is well adapted for turning ; naves of wheels, and handles of tools are made from it.

Vernacular names.—Burma : Ngumi ; *Ceylon* : Vakai, Vakal ; *English* : Horse Cassia, Red Cassia, Red Indian Laburnum, Roxburgh's Cassia ; *Malayalam* : Katakkonn ; *Sinhalese* : Ratuwaa ; *Tamil* : Iragattukkondrai, Karungondrai, Kattukkondrai, Kirudam, Kondrai, Mirinji, Narrikkondrai, Semmurungai, Sengondrai, Simaikkondrai, Sivappukkondrai, Sivattam, Tuvigayachin, Varibadi, Varikkondrai ; *Telugu* : Ettamunaga, Simarela, Uchakayamanu, Urimidi, Uskiamen.

THE HORSE CASSIA

CASSIA GRANDIS *Linnaeus filius*, Suppl. 230 (1781).

Description.—The Horse Cassia is common in Bombay.



It is a small tree with deep green foliage. The terminal leaflets on the younger leaves have a coppery tinge which

is very distinctive. The leaves are velvety to the touch as they are finely hairy above and below. A leaf contains from 10 to 20 oblong leaflets abruptly rounded at both ends. The flowers are rose-coloured ; they grow in the axils of the leaves in drooping racemes. There are no bracts at the base of the flower stalks. The pod is 3 in. or less in length, compressed, cylindrical, smooth, and transversely wrinkled.

Flowering season.—The Horse Cassia flowers in February and March when it has lost its foliage.

Distribution.—A native of tropical America ; grown in many tropical countries.

Uses.—The bitter pulp is used as a purgative.

Vernacular names.—Brazil : Canna Fistula dos Grandes, Mari-mari ; *English* : Horse Cassia, Pink Shower ; *French* : Casse du Brésil ; *French Guiana* : Casse ; *Spanish* : Casia del Brasil.

Standardised plant name, U.S.A.—Pink-shower Senna.

CASSIA MULTIJUGA *Richard* in Actes Soc. Hist. Nat. Paris, **1**, 10 (1792).

This is a small South American Cassia which was introduced into Bombay from Peradeniya, Ceylon. Its leaves contain from 20 to 25 pairs of oblong-elliptic leaflets, hence the name *multijuga*, which means "many yoked together." The leaflets are a bright green above and very pale, almost white, below. The tree bears masses of bright yellow flowers during August and September when it is in full leaf. This is the latest flowering Cassia. The cycle commences with the flowering of the Horse Cassias in February and ends with this species in September.

The leaves are utilised like senna leaves.

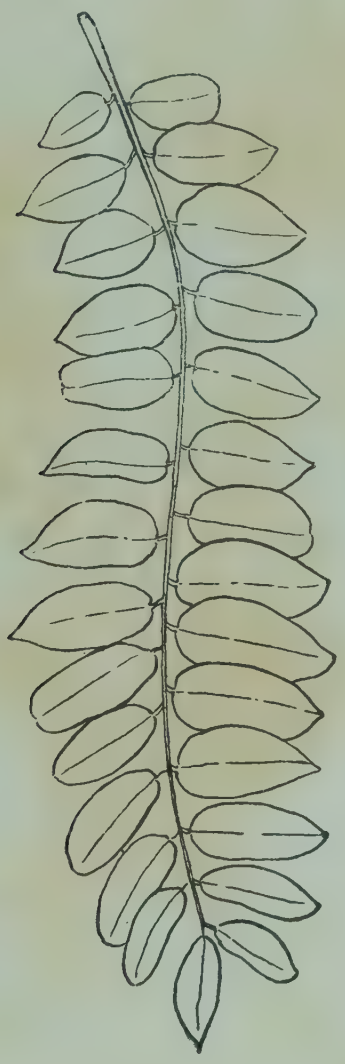
Burmese Pink Cassia

Cassia renigera

THE BURMESE PINK CASSIA

CASSIA RENIGERA *Wallich*, Cat. no. 5307 (1828-49) name only; Bentham in Trans. Linn. Soc. London, **27**, 518 (1871); Hooker f., Fl. Brit. India, **2**, 262 (1878).

Renigera means "kidney-bearing," in allusion to the kidney-shaped stipules.



Description.—A small, medium-sized tree growing about 18 to 20 ft. in height. The tree has a short trunk and a few upright branches which bear numerous slender, drooping branchlets. Clothed in feathery leaves, they reach downward like great spreading plumes. The leaf is abruptly pinnate; there is no terminal leaflet to its

main stalk. The young leaves spring from large kidney-shaped stipules which are quickly shed. The leaves grow from 4 to 12 in. in length. A single leaf is composed of from 8 to 20 pairs of short-stalked leaflets. They are oblong in shape, rounded at the apex, downy and soft to the touch. Leaf fall commences during December and by the end of March the tree is practically bare except for a few ragged leaves and the blackened pods which hang from its branches. In April the first buds appear. These open and in a few weeks the branches are smothered in a gorgeous profusion of pink and white blooms. Young leaves commence to spring up, making an assemblage of tender green leaves and masses of pink flowers which is very striking and beautiful. The flowers are large and showy. The older blooms fade from rose pink to white and give the clusters a variegated appearance. Each dense cluster of flowers is borne upon a short sturdy stem. The clusters arise singly or in pairs above the scars of the fallen leaves. Each flower-stalk springs from a downy leaf-like bract. These stalks are deep red in colour and covered with fine white hairs. The sepals which make up the calyx of the flower are dull red externally and tender green within. The petals are a deep pink, oblong in shape and nearly an inch in length. As the flowers commence to fade, the tips of the petals turn white, the pink gradually receding and then fading out altogether to leave the flower white. There are 10 stamens. The largest 3 are swollen at the centre and much curled and crowned with large tender green anthers. There are 4 smaller median stamens and 3 quite small erect ones. All of these are capped with anthers. The style is long, thread-like and deep red in colour. The pods are very similar to those of the Indian Laburnum. They are quite smooth, cylindrical and grow to 1 ft. or 2 ft. in length.

Flowering season.—The main flowering season is from May to July. Leaf fall commences during the cold weather and is completed by the end of March and the young leaves sprout in May, shortly after the tree is in full flower. Prain notes that the Shan Hills specimens have yellow flowers.

Distribution.—Dry zone of Upper Burma, now introduced into India and the Malay States.

Gardening.—The Burmese Pink Cassia which is so common in Bombay City was first introduced by the Hon. R. A. Forbes-Sempill, who sent three plants to Mr Millard from Rangoon about 1902. When the trees flowered, they were so beautiful that other specimens were obtained and, as the tree seeds quite freely, it has become quite common. The tree has not a long life but it grows rapidly. Trees planted from seed in a garden in Salsette in 1923 bore flowers for the first time in 1929 and in 1930 were about 18 ft. in height. The tree is cultivated for ornament. It grows and flowers well even in moist climates like those of Rangoon, Singapore and Bombay, although in its natural habitat this Cassia is accustomed to a dry climate and is capable of growing on comparatively poor soil.

A note by the late Rev. E. Blatter, S.J., with a photograph of *Cassia renigera* when it first flowered in Bombay, in May 1906, appeared in the *Journal of the Bombay Natural History Society*, Vol. **18**, page 1036 (1907).

Vernacular names.—Burmese : Ngusat, Ngushwe, Pwabet ; *English* : Burmese Pink Cassia.

THE YELLOW SILK-COTTON TREE

COCHLOSPERMUM RELIGIOSUM (*L.*) *Alston* in Trimen, Hand-book F. Ceylon, **6**, 14 (1931).

Syn. *Bombax religiosum* Linnaeus, Sp. Pl. **1**, 552 (1753)—*Bombax Gossypium* Linnaeus, Syst. Nat. 12th ed. **2**, 457 (1767)—*Cochlospermum Gossypium* De Candolle, Prodr. **1**, 587 (1824) ; Hooker f., Fl. Brit. India, **1**, 190 (1872).

The generic name is from the Greek κόχλιας [kŏchlias] "snail, anything spirally twisted," σπέρμα [sperma] "seed" ; the epithet *relĭgĭōsum* (referring to the gods) refers to its decorating the grounds of temples in Ceylon and southern India.

Description.—The Yellow Silk-cotton Tree is usually a small or medium-sized tree, averaging from 8 to 18 ft. in height. Its erect trunk, sometimes thicker than a man's

Yellow Silk-cotton Tree

Cochlospermum religiosum

body, and covered with smooth ash-coloured bark, supports a heavy crown of numerous branches. The young branches are covered with a soft fine down and marked with great scars of the fallen leaves. The leaves are scattered about the ends of the branches. They are smooth and bright green above and grey below, from a covering of whitish down. The leaf is borne on a long thick stalk ; it measures from 3 to 8 in. across the blade and may have from 3 to 5 pointed lobes. The buds

appear in small clusters at the end of the branches. Their much contorted, close-packed petals are cupped in a calyx composed of 5 silky overlapping sepals, which are shed when the buds open. The leafless branches are then decked in a glory of large golden-yellow flowers. They stand out against the dark boughs and provide a brilliant note of fresh colour to the bare stony hillsides where these trees mainly flourish. The flower has 5 bluntly-oval spreading petals with deeply cleft or irregular margins. The stamens are free and numerous, forming with their long red-gold anthers a dense cluster in the centre of the bloom. The dark brown pod is almost as large as a goose's egg. It measures about 2 to 3 in. in diameter, has 5 lobes and contains numerous kidney-shaped seeds embedded in soft silky wool.

Leaf-shedding, flowering and fruiting.—The leaves are shed during the cold season. The flowers appear about the

beginning of the hot season, at which time the tree is destitute of leaves, but these soon follow the flowers, The fruit ripens in May and June, the seeds being carried long distances by the strong winds which are often prevalent before or at the beginning of the rains.

Distribution.—Western sub-Himalayan tract from the Sutlej eastwards up to 3000 ft., Chota Nagpur, Bundelkhand, the drier parts of the Indian Peninsula, and the dry region of Burma. Characteristic of dry hilly country, occupying the hottest and stoniest slopes. Often planted in gardens and near temples. The tree does not occur near Bombay, though quite common in the Khandesh Satpuras and in the hills about Belgaum. It thrives well in gardens and is quick growing. Branches stuck into the ground root easily in wet weather.

Economic value.—The Santals prepare a good, useful cordage fibre from the bark of the tree. The bark abounds in a transparent gum which is largely used by the Indian shoemakers.

The leaves are used for the curious rude leaf-bellows with which the natives of the hills near the Assam valley smelt iron.

The cotton of the pods is used for stuffing pillows.

The seeds yield by hot expression large amounts of a bright red oil.

The wood is soft, and used for firewood and for torches.

Domestic uses.—In the Sambalpur district the wood immersed in water for eight days and the water strained off, mixed with flour and fried, is considered a nutritious food. In Celebes, the seeds are roasted and eaten ; young leaves are used to make a cooling wash for the hair.

Medicinal properties and uses.—The gum has the properties in a mild degree of Tragacanth, for which it is proposed as a substitute. It is also used as a mild demulcent in coughs. The floss has been recommended as admirably suited for padding bandages, splints, etc., being soft and cool. On this account it has been suggested as suitable for pillows and cushions used in hospitals, etc. The dried leaves and flowers are used as stimulants.

11. Yellow Silk-cotton Tree (*Cochlospermum religiosum*).

Mrs G. Cron

12. Flowers of the Yellow Silk-cotton Tree (*Cochlospermum religiosum*).

13. Colville's Glory (*Colvillea racemosa*).

C. McCann

14. Flowers of Colville's Glory (*Colvillea racemosa*).

Vernacular names.—*Arabic* : Katira ; *Bengal* : Golgol ; *Betul* : Galgal, Ganiar ; *Bhil* : Ganeri ; *Canarese* : Arasinaburaga, Arisinaburuga, Bettatavare, Buruga, Gagili, Kaduburaga ; *Chota Nagpur* : Sisibaha, Udal ; *English* : Yellow Silk-cotton Tree ; *Gond* : Gangam, Ganiar ; *Gujerati* : Kadachogund ; *Hasada* : Hupudaru ; *Hindi* : Gabdi, Galgal, Gangal, Ganiar, Gejra, Kumbi ; *Kolami* : Golgal, Hupu ; *Lambadi* : Hoghara ; *Madras* : Hill Cotton Tree ; *Malayalam* : Appakutakka, Chempanni, Chimappanni, Panninara, Parapanni ; *Marathi* : Galgal, Ganer, Ganeri, Ganglay, Gongal, Gulgul, Gunglay, Kathalyagonda ; *Naguri* : Galgaldaru ; *Nimar* : Galgal, Ganiar ; *North-Western Provinces* : Gajra, Kumbi ; *Persian* : Gone, Kathira-i-hindi, Kokamara ; *Punjab* : Kumbi ; *Saharanpur* : Arlu, Gejra ; *Santali* : Hopo ; *Saora* : Onkur ; *Sinhalese* : Elaimbul, Kinihiriya ; *Tamil* : Kannigaram, Kattilavu, Kattolaga, Kattupanju, Kattuparutti, Kongilam, Kongu, Kumarai, Malaiparutti, Manjardanakku, Nalol, Pachaigiluvai, Palini, Panjittanakku, Pinar, Sudinar, Tanakku, Turumorbalam ; *Telugu* : Adaviburaga, Akshotamu, Buraga, Gungu, Kondagogu, Kongu, Parijatamu, Pratti ; *Urdu* : Katira ; *Uriya* : Beniyamrydami, Ganiari, Konokopolaso, Kontopolas, Pobosokoniari ; *Bali* : Fjanigarath.

Standardised plant name, U.S.A.—Cotton Shellseed.

COLVILLE'S GLORY

COLVILLEA RACEMOSA *Bojer* in Bot. Mag. **61**, tt. 3325-26 (1834).

This leguminous tree belongs to the family *Caesalpiniaceae*. The name *Colvillea* honours a distinguished Scottish soldier, one of Wellington's best officers in the Napoleonic wars, Sir Charles Colville (1770-1843), who was Commander-in-Chief at Bombay from 1819 to 1825 and Governor of Mauritius from 1828 to 1834. The epithet *răcēmōsa* (full of clusters) refers to the flowers being arranged in profuse racemes.

Description.—A moderate-sized tree 40 to 50 ft. high with spreading branches. In general form and from the character of its foliage it might be easily mistaken for the Gul Mohur (*Delonix regia*). The leaves of the two trees are very similar. In the present species, the leaf is composed of from 20 to 30 pinnae or minor leaves—a Gul Mohur leaf has only 11 to 18. The pinnae bear 20 to 28 pairs of small elliptical leaflets arranged opposite each other. In the Gul Mohur these leaflets are more oblong.

The flowers are very curious and striking. In the bud they are almost nut-like in form and appear in large drooping clusters, the buds diminishing in size as they approach the end of the raceme. The sepals are more or less obliquely shaped in outline and sharply pointed. Externally they are silky to the touch. Their colour ranges from bright orange to red. Internally they are smooth and creamy. The standard petal of the flower is the smallest and not the largest as is usual. It is orange-red, and is flanked by two very long narrow erect wing petals, deep red in colour. Opposite the standard petal is the rudimentary boat-shaped keel petal. The 10 stamens are free, 3 of them inserted below the standard, 2 under the wing petals, 1 under the keel, and 4 under the ovary. The anthers are yellow. The clumps of bright-coloured flowers among the feathery grey-green

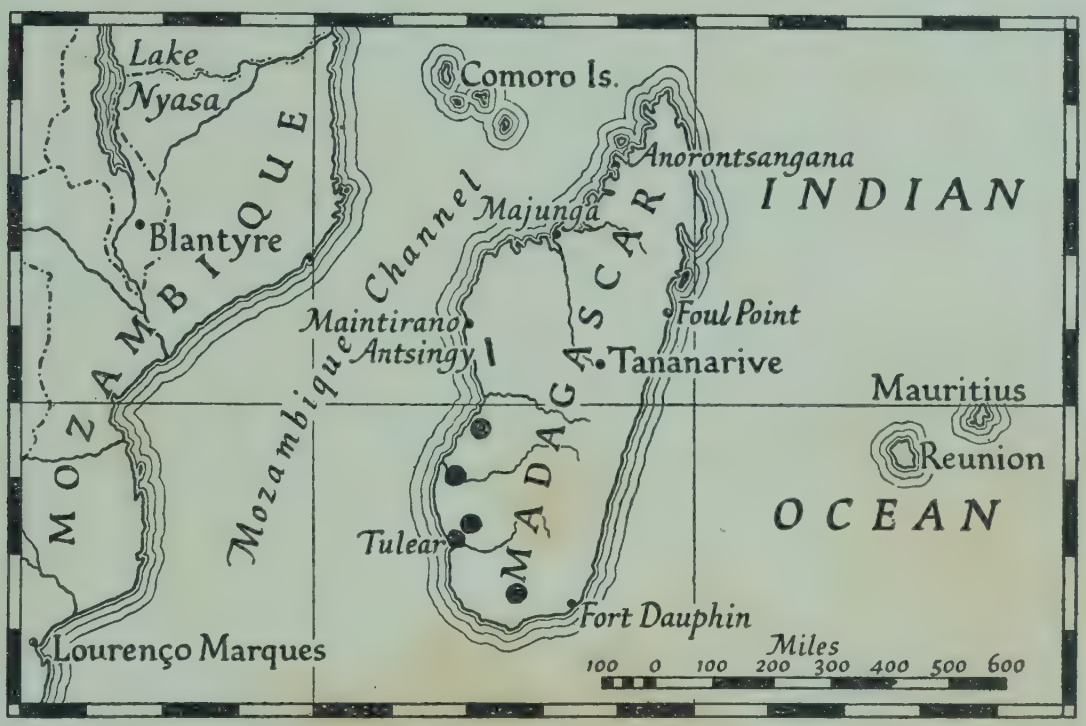
Colville's Glory

Colvillea racemosa

foliage give the tree a very striking appearance. The pod is 2-valved and round.

Flowering.—In India the tree flowers in July and August, but in Madagascar it flowers in April or May. It grows well in Bombay and flowers there in August or September, the erect flower scapes being very noticeable, standing well above the foliage. "Colville's Glory" is an excellent name for this beautiful tree.

Distribution.—The only member of the genus *Colvillea*, this endemic Madagascar species was discovered in 1824 by Bojer (see p. 53) near Majunga, where he found a single cultivated tree of unknown provenance. He took seeds to Mauritius and raised plants; thence it has been introduced to India, the Hawaiian Islands, etc. According to Prof. H. Humbert, it grows wild in south-eastern Madagascar; the large dots on the map indicate its general distribution.



Gardening.—It is suited to moist or moderately dry low country, and is only propagated from seed. Though it is well worthy of cultivation for its beautiful flowers and foliage, it is seldom seen outside botanical gardens and flower fanciers' collections.

Standardised plant name, U.S.A.—Glory Colvillea.

THE SCARLET CORDIA OR ALOE-WOOD

CORDIA SEBESTENA *Linnaeus* Sp. Pl. 1, 190 (1753).

Cordia is named after Valerius Cordus (1515-44), an ill-fated early German herbalist of genius, who died at the age of twenty-nine but holds an honoured place in the history of botany for the remarkable accuracy, detail

and clarity of his posthumously published descriptions of plants. *Sebestena* is derived from the Persian word *sapistan* applied to the fruit of an allied species which grows near the town Sebesta.

The genus as commonly defined contains about 250 tropical and sub-tropical species ; some are vines, some herbaceous, some yield drugs, and others useful timbers and others again bear edible fruits. The fruit of a common Indian species, *Cordia Myxa*, is used in medicine under the name of *sebesten* or *sepistan*, a term which, as indicated above, gave the specific name to the present species. Cordia belongs to the family *Boraginaceae*.

The tree is rendered conspicuous in gardens by its

Scarlet Cordia

Cordia Sebestena

bunches or clusters of beautiful orange-scarlet flowers which appear practically at all seasons of the year.

Description.—A tall evergreen shrub or small tree, growing from 15 to 30 ft. in height. The leaves grow alternately on the branches. They are from 4 to 6 in. in length, large, oval or elliptic in shape and blunt at the apex. The leaves are rough to the touch, being much wrinkled, furrowed above and heavily ribbed below.

Young plants in fresh verdant green leaf are very handsome. The showy orange-red flowers appear in large open clusters at the ends of the branches. The flower is funnel-shaped, its tubular portion enclosed for half its length in a heavily ribbed green calyx. Its petals are 6, rounded and heavily wrinkled. There are 5 to 12 stamens crowned with dull yellow elongate anthers which do not protrude beyond the mouth of the corolla. The fruit is $1\frac{1}{2}$ by $\frac{3}{4}$ in. It is pure white and enclosed in a hazel-like husk formed by the persistent calyx.

Flowering season.—January to March. But the tree will be found in bloom throughout the year.

Gardening.—Propagated by cuttings of firm wood and by seeds which are sown when quite fresh.

Native country.—Cuba, Jamaica, Hispaniola and other West Indian Islands.

Uses.—It is useful for decorative purposes.

Vernacular names.—Canarese: Challekendala, Kempuchalle, Kendala; *English*: Aloe-wood, Cuba Sebesten, Geiger Tree, Scarlet Cordia, Sebesten Tree; *French*: Sébestier; *Tamil*: Achinaruvili, Ponnaruvili; *Telugu*: Virigi.

Standardised plant name, U.S.A.—Geigertree Cordia.

Plate IX

Sacred Barna

Crataeva Nurvala

THE SACRED BARNA

CRATAEVA NURVALA *Buchanan-Hamilton* in Trans. Linn. Soc. London, **15**, 121 (1827).

Syn. *Capparis trifoliata* Roxburgh, Hortus Beng. 41 (1814) name only, Fl. Ind. ed. alt. **3**, 571 (1832).

Crataeva commemorates Cratevas (Krateuas), an obscure Greek writer on plants in the first century B.C., who was physician to Mithridates. His writings are known to-day only from a few fragments preserved in the works of later authors. He is reputed to have been a skilled artist ; some of the drawings of plants in a fifth-century manuscript, *Codex Vindobonenis*, may be copies of drawings by Cratevas. *Nurvala* is a Southern Indian vernacular name.

This plant belongs to the *Capparidaceae* or Caper family. It has long been known under the name *C. religiosa* Forst. in India, being described as such in Hooker f., *Fl. Brit. India*, **1**, 172 (1872), but that name belongs to a totally different Polynesian tree.

Description.—The Sacred Barna is a small tree with a much branched head of glossy foliage, its leaves clustering mainly towards the ends of the branches. The tree sheds its leaves during the cold weather. The leaf is trifoliolate. It is composed of 3 leaflets growing on a long slender stalk which may be from $1\frac{1}{2}$ to 3 in. in length. The leaflets are from 2 to 6 in. long. Their shape varies from oval to lance-shaped or they taper to a fine point. They are covered with a network of veins, smooth on both surfaces, glossy above and pale, almost white below. The young leaves appear with or sometimes before the flowers. The tree is very handsome when in full bloom. The flowers grow in dense greenish-white clusters at the ends of the branches. Each cluster is borne upon a sturdy stalk. The sepals of the flowers are small, oval and pointed at the apex. They are green when young, fading to pale pink or yellow. The white petals also fade to yellow. They measure 1 by $\frac{3}{8}$ in. There is a very

narrow petal claw ¼ in. in length. A bunch of long, thread-like spreading stamens protrudes from the flower. They are much longer than the petals and purple or white when young, lilac when old. The Sacred Barna is one of a class of plants which is called gynophorous, which means that it bears its ovary at the end of a long stalk. The gynophore in the present species appears like a lilac thread 2 in. long with the swollen ovary at the tip. When the petals fall away the thread-like gynophore remains ; it thickens and bears a globular woody fruit which contains numerous brown, nearly smooth seeds.

Distribution.—Throughout most parts of India and Burma, wild or cultivated. Often found along streams, but sometimes occurs almost gregariously on dry, deep boulder formations in the sub-Himalayan tract from the Ravi eastwards. A favourite tree near temples and tombs. It is a common tree in Bombay, where it is known as " Wai-warna."

Leaf-shedding, flowering and fruiting.—The tree is leafless in the cold season, the new leaves appearing in February and March. The handsome lax-clustered flowers, white, turning yellowish or pale pink, having numerous prominent stamens with purple filaments, appear in March to May (December to April in Southern India ?), and the fruit, a hard-rinded many-seeded berry, 1 to 2 in. in diameter, ripens in the rains (about August in Northern India). The seeds are about ⅕ in. in diameter, somewhat compressed, helicoid-reniform or irregularly circular, dark brown ; testa hard but splitting readily along a suture round the seed. The coloured plate shows a rounded gall in the lower right hand corner ; this occurs frequently and is easily mistaken for the fruit.

Gardening.—Although often found in moist shady places the tree is more a light-demander than a shade-bearer. It is partial to loose deep alluvial soil near streams, while its long taproot enables it to grow on deep boulder formations where water is at some depth. It is sensitive to frost, at all events in its early stages. It produces root-suckers freely.

15. Flowers of the Sacred Barna (*Crataeva Nurvala*).

C. McCann

16. The Sacred Barna (*Crataeva Nurvala*).

Two conditions favourable for natural reproduction are bare ground and sufficient moisture. Seed scattered in grass or among weeds both on moist and on dry ground, or in dry situations on bare soil, persistently failed to germinate, while if scattered on moist bare ground it germinated both in the open and under dense shade,

though in the latter case the shade soon killed off the seedlings.

Seed should be sown at the time of ripening, in the rains, on deep loose soil kept sufficiently watered, or in deep pots or boxes, and transplanted during the following rains. The seed may not germinate, even if kept regularly watered, until about May or June of the year after sowing, in which case the plants will be ready for transplanting about August or early September ; they are then ordinarily about 3 to 6 in. high. Owing to the long taproot care is necessary in transplanting.

Economic value.—Wood is yellowish-white, when old turning light brown, moderately hard, even-grained. Used for drums, models, writing-boards, combs, and in

turnery. In Trichinopoly it is also used for making planks and as firewood.

The fruit is edible.

The pulp mixed with mortar makes a cement, and the rind is used as a mordant in dyeing.

Medicinal properties and uses.—The bark is demulcent, antipyretic, sedative, alterative, and tonic ; and the fresh leaves and root-bark are rubefacient.

The bark is useful in some cases of urinary complaints and fever, and in some mild forms of skin diseases in which sarsaparilla is generally resorted to. It also relieves vomiting and other symptoms of gastric irritation. The fresh leaves and root-bark, particularly the former, are very efficacious in all the affections in which mustard poultice is indicated.

" Bruised well with a little vinegar, lime-juice or hot water and applied to the skin in the form of a poultice or paste, the fresh leaves of *C. religiosa* (*C. Nurvala*) act as a rubefacient and vesicant so efficiently that I do not hesitate in saying that they are not only much superior to the mustard seeds in this country, but also quite equal, if not superior, to the flour of that drug imported from Europe. From 5 to 10 or 15 minutes is the time required for them to produce their full effect as a rubefacient, and if kept longer than this in contact with the skin they begin to act as a vesicant. The existence of one or two plants of *C. religiosa* (*C. Nurvala*) in each Hospital or Dispensary garden will certainly save them from the cost of the supply of European mustard for external use.

" The fresh root-bark of this plant is also a very good rubefacient and vesicant, but it is rather too dear and not procurable in large quantities. The bark of the stem is very thick (from 1 to 2 in. when fresh, and from ½ to 1 in. when dry), greenish-brown on the outer side, and grey or pale-white internally and on the inner side, and almost tasteless and odourless. It is one of those barks which can easily be reduced to a coarse powder immediately after its removal from the stem " (Moodeen Sheriff).

The bark of the stem and root of this plant constitute

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the principal medicine of the Hindu pharmacopœia for calculus affections. It is said to promote the appetite, decrease the secretion of the bile, act as a laxative and remove disorders of the urinary organs.

In Bombay, the leaves are used as a remedy for swelling of the feet and a burning sensation in the soles of the feet. The leaf-juice is given in rheumatism in the Konkan, in doses of ½ to 3 tolas, mixed with coconut juice and *Ghi*. In caries of the bones of the nose, the leaf is smoked and the smoke exhaled through the nose. The bark and the leaf pounded and tied in a cloth are used as a fomentation in rheumatism.

The bruised roots, leaves and seeds are applied to the wounds in snake-bite. Neither the bark nor the leaves is an antidote to either snake or scorpion venom (Caius and Mhaskar).

Popular beliefs.—This tree is found planted near tombs in several different parts of the world.

Popular names.—Bengal : Barun, Tiktoshak, Varuna ; *Bombay* : Bhatavarna, Hadavarna, Kawan, Kumla, Vayavarna, Waruna ; *Burma* : Kadat, Kadet, Katat ; *Canarese* : Bilpatri, Bitusi, Hoddelenage, Mavilinga, Narave, Neravambele, Neravele, Nervala, Tudemadirenge, Vitusi ; *Central Provinces* : Bel, Bela ; *Chinese* : Pa Yeh ; *Coorg* : Nerajane, Nirajani, Nerujani, Vittasi, Vitusi ; *Gujerati* : Varno, Vayavarno ; *Hansot* : Kagdakeri ; *Hindi* : Barna, Barua, Barun, Bila, Bilasi, Biliana, Varuna, Varvunna ; *Konkani* : Nervol ; *Lao* : Mai fuk koom ; *Lepcha* : Purbong ; *Malay* : Cadat ; *Malayalam* : Kili, Niravila, Nirumaliyan, Varana, Vitusi ; *Marathi* : Haravarna, Karvan, Kumla, Nirvala, Ramala, Varun, Vayavarna ; *Mechi* : Bunboronda, Tailadu ; *Punjab* : Barna, Barnahi ; *Rajputana* : Barna, Barnahi ; *Saharampur* : Barna, Bilarsi, Brarka ; *Sanskrit* : Ajapa, Ashmarygna, Barhapushpa, Kumaraka, Mahakapittha, Marutapaha, Pasunadha, Sadhuvriksha, Setuka, Shikhimandala, Shvetadruma, Tamala, Tiktashaka, Urumana, Varuna, Vasaha ; *Sinhalese* : Lunuwarana ; *Tamil* : Adicharanam, Adimalam, Anjani, Inaivilai, Kattumavilangai, Kavilam, Maluram, Maralingam, Mavilangai, Miguttiyal, Narvala, Nilluvam, Nirumaliyam, Periamavilangai, Shuppigam, Shuvedan, Sinnamavilingam, Tiriburamerittan, Varanam, Villuvam ; *Telugu* : Bilvaram, Chinnavulimidi, Magalingam, Maredu, Peddamagalingam, Peddavulimidi, Tellavulimidi, Ulimidi, Urumudu, Usiki ; *Urdu* : Barna ; *Uriya* : Barun, Boryno, Varuna.

THE GUL MOHUR OR FLAMBOYANT

DELONIX REGIA (*Bojer*) *Rafinesque*, Fl. Tellur, **2**, 92 (1836).
Syn. *Poinciana regia* Bojer in Bot. Mag. **56**, t. 2884 (1829).

For the derivation of *Delonix*, see below. *Poinciana* was named after a M. de Poinci, governor of the French Antilles in the mid-seventeenth century.

The origin and derivation of the name " Gul Mohur " is difficult to trace. " Gul " means " rose or flower " and " Mor " is the Hindustani name for " peacock." The English name of Bengal or Royal Gold Mohur is also applied to this tree. Mr C. E. C. Fischer of Kew considers the name Gold Mohur is a corruption of the vernacular epithet " Gulmohr " (anglice—Peacock-rose). The word " Mohur " may have been adopted from that of an old Indian coin or seal.

The tree was growing at Sewree (Bombay) about 1840 (? 1846 or 1848)—*vide* footnote on p. 114, Vol. I, of the *Gazetteer of Bombay City and Island* by the late S. M. Edwardes, C.V.O., C.S.I.

Description.—A large deciduous tree, growing from 40 to 50 ft. in height with spreading branches and very

handsome feathery leaves. The foliage is particularly beautiful when the tree is young and the airy elegance of its leaves more in evidence. The leaves may attain a length of 2 ft. The leaf is composed of from 11 to 18

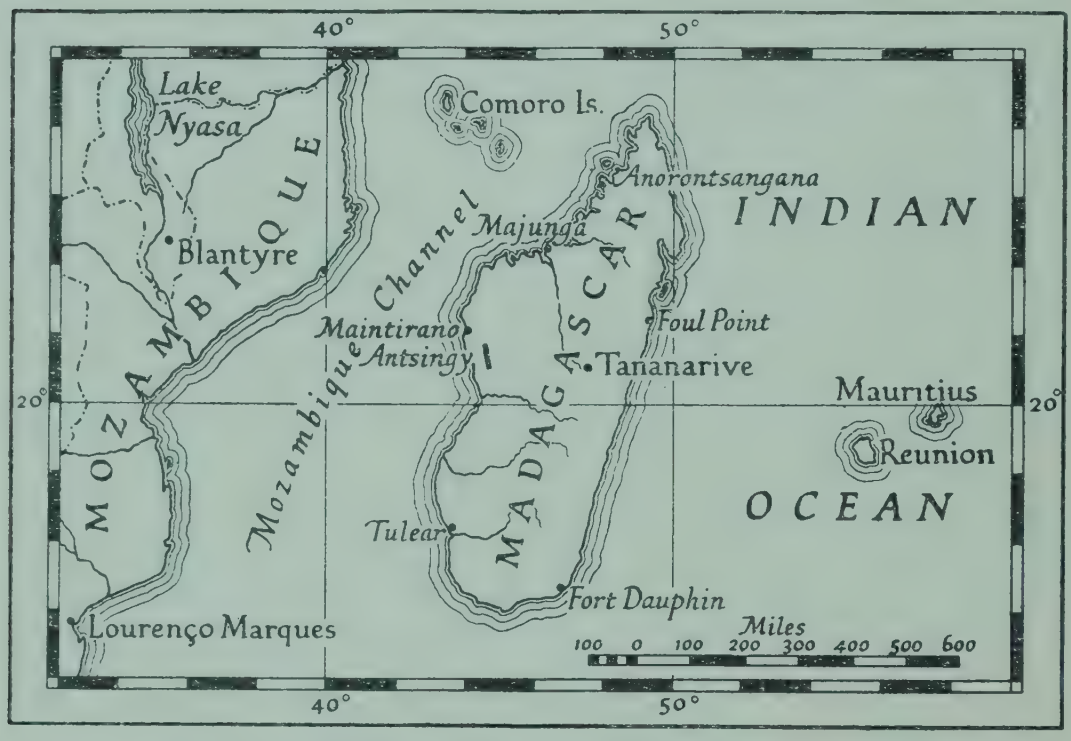
pinnae or minor leaves arranged in pairs along the mid-rib. The pinnae bear from 20 to 30 pairs of small oblong leaflets, each measuring $\frac{1}{3}$ to $\frac{2}{5}$ by $\frac{1}{10}$ to $\frac{1}{6}$ in. The tree sheds its leaves between February and March and during this period, which immediately precedes its flowering season, it stands gaunt and bare save for the long, sabre-like seed pods, hanging from its leafless branches. The young leaves appear towards the end of May or early in June, and by the time the rains are well established, the tree is once again covered with its feathery foliage. The flowers appear with the onset of the hot weather, a few at first, then more and yet more till by mid-May the tree is a vivid and brilliant mass of scarlet blooms. The flowers are arranged in immense racemes at the ends of the branches. Individually examined, each flower is seen to be composed of 4 scarlet petals, while the fifth, the standard petal, is slightly larger in size and much variegated in colour. It is yellow or white and usually streaked with red. The flowers vary considerably in intensity of colouring. A whole range of tones from orange-vermilion to deep scarlet is exhibited. The deep scarlet form is particularly handsome. Each petal appears as a rounded spoon-shaped blade with a delicately crinkled margin. Its base is long and narrow, technically described as clawed. The petals emerge from between 5 fleshy scarlet-faced sepals which constitute the calyx. The stamens protrude in a cluster of 10 red filaments, surrounding a tender green style. The whole flower measures about 4 in. across.

Flowers during the hot weather.

Fruit.—The pods are green and flaccid when young. They harden with age, turn a deep brown and remain for a long time on the tree. They measure 1 to 2 ft. in length. The seeds are oblong and transversely mottled.

History and Distribution.—This species was first made known by Wenzel Bojer (1797-1856), an Austrian botanist who went out to Mauritius in 1821 and from there made collecting expeditions to Madagascar and other islands, by which many fine plants, among them *Delonix regia* and *Colvillea racemosa*, were introduced into cultivation.

He found the Flamboyant in 1828 at Foul Point on the east coast of Madagascar. A fine coloured plate by Bojer was published in the *Botanical Magazine*, t. 2884, under the name *Poinciana regia*, in 1829. Bojer introduced it into Mauritius, whence it soon found its way to India. At Foul Point it does not reproduce itself of its own accord and is evidently a tree introduced from elsewhere. Its original home, though presumed to be Madagascar,



Sketch map of Madagascar showing Antsingy forest reserve (marked I), the native home of *Delonix* (*Poinciana*) *regia*.

long remained unknown. As recently as June 1932 H. Perrier de la Bathie, an authority on the flora of Madagascar, expressed doubt as to its being a native of the island, although he suggested at the same time that it might be an ancient endemic species of Madagascar which had become extinct as a wild plant, since much of the original forest vegetation of Madagascar has now been destroyed. However, in October 1932 J. Leandri found the Flamboyant undoubtedly indigenous in the forest reserve of Antsingy at two places, where it grew on steep calcareous rocks ; *cf.* Leandri in *Bull. Mus. Nat. Hist. Nat.* (Paris), II, 5, 414 (1933), 8, 568 (1936). This region of western Madagascar is far removed from

Gul Mohur or Flamboyant

Delonix regia

the place in eastern Madagascar where Bojer first discovered the Flamboyant, and to which it seems to have been introduced by the Arabs. According to Decary, the Arabs, who colonised part of the coast of Madagascar from the ninth or tenth century onwards, probably introduced it first to the region of Anorontsangana where it still persists among the ruins of ancient settlements. From here it was carried to the north-eastern side of Madagascar where the Arabs likewise had possessions, thus arriving at Foul Point, where Bojer found it. Now it is cultivated throughout the Tropics.

Bojer's plate in the *Botanical Magazine*, **56**, t. 2884 (1829), came to the notice of an American botanist with a craze for naming new genera, Constantine Samuel Rafinesque (1783-1840), who, accordingly, proposed a new genus for it in his *Flora Telluriana*, **2**, 92 (dated "1836," but first published in 1837; reprinted 1946). His account is as follows :—

"350. DELONIX R. (evident claw). Legum. diff. *Poinciana*, Cal. eq. non fornic. Pet. 5, subeq. unguis longissimis, limbo, crenatis flabellatis. Stam. 10 ineq. glabris declinatis.—*D. regia* Raf. *Poinciana regia* Hook. b.m. 2884. inermis, fol. bipin. ovatobl. muticis. A beautiful tree of Madagascar, with large scarlet flowers. The *G. Poinciana* DC. separated from *Caesalpinia* is American with uneq. cal. hooded, petals unequal, stamens hairy, etc."

This extract well illustrates Rafinesque's rather scrappy method of publication, his telegram style and use of abbreviations. He never missed an opportunity to split old genera and to propose new names, a number of which have been found to be justified. A more detailed description of the genus *Delonix* will be found in J. S. Gamble's *Flora of the Presidency of Madras*, **1** (3), 396 (1919). It is technically distinguished from *Poinciana* in having the calyx-lobes not imbricate but valvate (*i.e.* touching along the sides in bud without overlapping). The name *Dēlŏnix* is from the Greek δῆλος [dēlŏs] conspicuous, ὄνυξ [onux] "claw, nail, anything shaped like a claw or nail, *e.g.* the base of a rose-petal," and alludes to the long-clawed petals.

Cultivation.—The tree is largely grown throughout the tropics for decorative purposes and as a shade tree. It grows freely in good soil, thriving best under fairly dry conditions, especially near the sea ; but great attention must be paid to pruning if a good head is to be developed. Usually grown from seed, it is also raised from cuttings. The form with deep scarlet flowers is so handsome that it deserves wider propagation. As the seeds may not come true to colour, it would be advisable to make cuttings of this variety, of which there are a good number in and around Bombay. The Gul Mohur is a fast-growing tree. It has spreading superficial roots which kill out other plants. The shallow root system unfortunately renders it liable to be blown down during storms.

The Gul Mohur is often confused with the Peacock Flower or Barbados Pride (*Caesalpinia pulcherrima*), better known as *Poinciana pulcherrima*, and often referred to in this country as the Gold Mohur Shrub. This plant is a shrub or at most only a small tree, with calyx segments strongly overlapping in the bud, much smaller flowers and protruding stamens several times as long as the petals. It is the type-species of the genus *Poinciana* and as it is now placed in *Caesalpinia* by most botanists, the name *Poinciana* has accordingly become a synonym of *Caesalpinia.* Hence the adoption of the generic name *Delonix* for the Gul Mohur.

Economic value.—The tree yields a gum in irregular granular or warty tears of a yellowish or reddish-brown colour ; it is soluble in water, forming a thick opalescent mucilage.

The wood is white, light—28 lb. per cubic foot—soft, loose-grained, and takes a fine polish.

The Gul Mohur makes a useful avenue tree, especially when planted alternately with a good shady tree.

One of the compensations of the hot weather in the plains of India is the profusion of beautiful flowering trees and perhaps one of the most conspicuous, from April to June, is the Gul Mohur.

Vernacular names.—In Madagascar, the tree is called Flamboyant and by some Flame of the Forest, a name

which appears to be given to several trees in this country, including the Coral Tree (*Erythrina indica*) described on p. 63, but we consider, in India, the name is particularly and only applicable to the Palas or Dhak tree (*Butea monosperma*).

The Ashanti name "sempowadua" or "threepence tree" was given because the seeds of this tree were originally sold in the Sunyani district for 3d. each.

Ashanti : Sempowadua, Sempowarma ; *Betsimisaraka* : Tanaho ; *Canarese* : Doddaratnagandhi, Kattikayi ; *English* : Fire Tree, Flame Tree, Gold Mohr, Gold Mohur, Gul Mohur, Royal Gul Mohur, Royal Peacock Flower ; *French* : Flamboyant ; *Malayalam* : Alasippu ; *Marathi* : Gulmohr ; *Philippines* : Arbol del fuego ; *Sakalave* : Volotsara ; *Tamil* : Mayirkkondrai, Mayirgondrai, Mayuram, Panjadi, Perumayirgondrai, Vadanarayanan ; *Telugu* : Ettaturayi, Peddaseribiseri, Peddaturayi, Simasankeswaramu, Turayi ; *Tulu* : Kodu.

Standardised plant name, U.S.A.—Flamboyant Tree.

THE WHITE GUL MOHUR

DELONIX ELATA (*L.*) *Gamble*, Fl. Madras **1**, 396 (1919).
Syn. *Poinciana elata* Linnaeus, Amoen. Acad. **4**, 313 (1759) ; Hooker, Fl. Brit. India, **2**, 260 (1878).

The epithet *ēlāta* means "lofty, tall."

Description.—An erect tree growing 20 to 30 ft. in height with a tolerably smooth ash-coloured bark. The leaves are similar in character but smaller than those of *D. regia*, being 4 to 8 in. long. The main or mid-rib of the leaf carries a smaller number of minor ribs or pinnae ; there are from 4 to 8 pairs arranged opposite. The leaflets, almost stalkless, are closely set in from 10 to 20 pairs along the ribs. Their shape is linear-oblong, somewhat pointed at the apex. They are quite smooth and readily shed. The flowers grow at the end of the branches in racemes. There are not many flowers in each cluster. The stalks of the lowest flowers are longest, thus all the flowers forming the cluster come up to the same level (corymbiform). The pedicels or stalks of the flowers are downy (pubescent). The calyx, ¾ to 1 in. long, is leathery and, like the stalk, covered with a silky down externally. The sepals or segments of the calyx are

oblong, very narrow and sharp-pointed. The petals are white at first and then change to yellow. The upper petal is usually smaller and of a deeper colour than the others. The petals do not project much beyond the calyx ; in shape they are almost round (sub-orbicular) and very much curled at the margins. The stamens are downy, dark coloured, 2 to 4 in. long, and thickened at the base. The pods measure 5 to 7 in. by $\frac{3}{4}$ to $\frac{1}{4}$ in. They are smooth, narrowed at both ends and marked with a network of veins. The seeds number 4 to 8.

Flowering season.—August-March (Brandis) ; June-September (Cooke) ; in the hot season or early rains (Troup) ; therefore practically the whole year. Troup calls it a practically evergreen tree.

Distribution.—Abyssinia, Arabia, in India perhaps indigenous in the Porebunder State. Cultivated in many parts of India.

Gardening.—Capable of growing in poor dry soil, even in crevices of rocks, where, however, it is stunted. Often cultivated for ornament. It grows fast and is easily raised from seed.

Commonly planted as an avenue tree in Indo-China.

It was introduced into the Botanical Garden of Calcutta in 1792 and 1799.

Economic value.—The tree yields a dark coloured and mucilaginous but unimportant gum.

The leaves and twigs are employed in Madras as a manure.

The wood is yellow, close, and even-grained, easily worked ; gives a smooth surface ; warps slightly, but does not crack ; weight, when seasoned, 45 to 47 lb. per cubic foot. It is well suited for cabinet work.

The tree has been successfully used as a protection for the footings of rivers and channel banks, where it is wanted not to spread laterally and to cause obstructions.

Medicinal uses.—There is a popular belief that the touch of the root removes the pain of a scorpion sting.

Vernacular names.—Bombay: Vayni ; *Canarese* : Kempukenjiga, Nirangi, Sonkesari, Sunkanthemara ; *English* : Creamy Peacock Flower, Tiger Bean, White Gul Mohur ; *French* : Flamboyant ;

White Gul Mohur

Delonix elata

17. The Gul Mohur (*Delonix regia*) in flower.

C. McCann

18. The Gul Mohur (*Delonix regia*) in fruit.

Gujerati : Sandesra ; *Indo-China* : Diep tay, Kangok, Xoan tay ; *Marathi* : Sandesra, Sankasura ; *Tamil* : Padenarayan, Pandenaryan, Perungondrai, Vadanarayanan, Varatti ; *Telugu* : Chilikeswarapu, Chinnaseribiseri, Chittikeswaramu, Sunkeswar, Sunkeswaram, Sunkevaramu, Vatanarayana ; *Uriya* : Simamondaro.

Caesalpiniaceae

They are mostly trees and shrubs with pinnate leaves and handsome, irregular flowers. They are chiefly grown for their showy flowers and also for their attractive finely divided foliage.

In the tropics, and also in subtropical climates, these shrubs and trees are always admired and are commonly planted for ornament, as *Delonix*, *Peltophorum*, *Cassia*, *Saraca*, *Bauhinia*, *Amherstia*, *Colvillea*. The family takes its name from the genus *Caesalpinia*, which commemorates the Italian philosopher, botanist and mineralogist Andrea Cesalpino (1519-1603), author of *De Plantis Libri* xv (1583).

It belongs to the Order *Leguminosae* (see p. 78). Before their introduction into general cultivation such remarkable and distinct plants as *Amherstia*, *Colvillea* and *Delonix regia* were extremely limited in range and possibly approaching extinction.

THE LARGE-FLOWERED DILLENIA

DILLENIA INDICA *Linnaeus*, Sp. Pl. 1, 535 (1753) ; Hooker f., Fl. Brit. India, 1, 36 (1872) ; Hoogland in Blumea, 7, 108 (1952).

An erect evergreen tree which in favourable localities grows to a height of 30 or 40 ft. Its spreading branches form a rounded crown of handsome bright green foliage. The bark is smooth, red and moderately thick. It peels off in small hard scales. The leaves grow at the ends of the branches. The leaf-stalk is channelled, about 1 to 2 in. long, its base partially encircling the supporting branch. An average leaf is 8 to 12 in. long and 4 in. in breadth. It is oblong lance-shaped with a finely pointed apex and sharply toothed margin. The close-set nerves running in regular parallel lines to the marginal teeth give the leaves a beautiful deeply fluted surface. The upper part of the leaf and the nerves beneath are covered with fine hairs. The large fragrant white flowers appear singly at the ends of the branches. They may exceed 6 in. in diameter. The club-shaped stalk of the flower is 3 in. long, round and smooth. The calyx is composed of five fleshy, rounded, concave sepals, which persist and form the outer covering of the fruit. The five large petals are oblong and heavily crinkled. The numerous stamens form a yellow crown round the white spreading rays of the stigma. The fruit is large and hard. With the sepals which surround it it measures from 3 to 4 in. across. Internally it is fleshy and its many flat seeds are embedded in a glutinous pulp.

Flowers.—The flowers appear in June and July.

Distribution.—Moist and evergreen forests of the eastern sub-Himalayan tract, Assam and Burma, and of the Indian Peninsula, extending also to Indo-China, Borneo and Java. Chiefly along tropical forest streams and rivers and other damp places, on deep rich moist soil.

The fruits are buoyant in water, and those which drop into the streams from the trees along their banks are carried down until stranded. Wild elephants eat the fruits, and are possible agents in the spread of the

Large-flowered Dillenia

Dillenia indica

seed. Under ordinary conditions, however, the seed has no means of escaping from the fruit owing to the rigid covering of the thickened sepals, and Nature's method of overcoming the difficulty is interesting. The fruit on reaching the ground quickly turns brown, decays and, in the hot season, shrivels into dry masses. White ants eat out the interior and fill the dry shell with earth. The seeds, however, remain untouched, and at the commencement of the rains they germinate in the earth accumulated by the white ants, and the seedlings burst through the many cracks and joints of the dried shell.

Gardening.—The plants are propagated from seed sown during the rains, in June and July ; they propagate with difficulty from cuttings. The tree reproduces satisfactorily from coppice-shoots, as in the Holongapar coppice coupes in Assam. The growth is moderately fast. The tree cannot be cultivated on the hills in Northern India.

Economic uses.—The tree is planted as an ornament ; it is the showiest of the whole family, being equally attractive in foliage, flower and fruit.

Both the *Tassar* (*Tussore*) and *Atlas* moth silk-worms are said to feed upon the leaves.

The bruised bark is used for tanning.

The wood is red with white specks, close-grained, moderately hard, durable under water, weighing 40 to 45 lb. a cubic foot. It is used to make helves and gun-stocks, and in construction. It makes good firewood and charcoal.

Domestic uses.—The fruit, as it hangs upon the tree, resembles enormous green apples of the size nearly of a child's head. They are gathered for use when full grown. The part made use of for the table is not the fruit itself but the large, thickened sepals of the calyx, by which it is firmly enclosed. Tasted raw these have the exact flavour of a very sour unripe apple ; and when cooked with sugar they have also exactly the flavour of the same fruit cooked in the same way. The great objection to them is the large quantity of fibres they contain. They are very commonly mixed as an ingredient in curries, especially prawn-curries, to which they impart a most agreeable flavour. They are also made into a pleasant

jelly. The acid juice sweetened with sugar forms a cooling drink.

Medicinal uses.—The bark and the leaves are astringent. The bruised bark is applied as a cataplasm in arthritis.

The unripe fruit is said by Ayurvedists to be sour, bitter, and pungent ; the ripe fruit is described as sweet, sour, tasty. The fruit regulates the heat of the body, tones up the nervous system, dispels fatigue, and stops abdominal pain.

Vernacular names.—Assam : Chalita, Otengah ; *Bengal* : Chalita, Chalta, Hargesa, Ruvya ; *Bombay* : Karambel, Mothakarmel, Mothekaramala ; *Burma* : Thabyu, Thibuta, Zinbrun, Zinpyunngan ; *Canarese* : Bettadakanagal, Bettakanigala, Ganagalu, Kadkanagula, Kanagala, Kanigala, Neyitaku ; *Deccan* : Mutakurmul ; *Garo* : Panpui ; *Gujerat* : Karmbal, Otaphal ; *Hindi* : Chalta, Chaltr, Gilnar, Girnar ; *Indo-China* : Dok shan, So ba ; *Kachin* : Masang ; *Kolami* : Korkotta ; *Konkani* : Corombol ; *Lepcha* : Kyangmozhu, Phanisikol, Phan-se kung ; *Magahi* : Chauralesi, Thapru ; *Malay* : Chimpuh, Simpoh ; *Malayalam* : Chalita, Punna, Syalita, Valapunna; *Marathi* : Karmbel, Motakarmal, Motakarmbal ; *Monghyr* : Chilta ; *Mundari* : Korkotadaru, Karkutadaru ; *Nepal* : Panchkule, Panchphal, Ramphal ; *Sanskrit* : Bhavya, Ruvya ; *Santal* : Korkot, Korkotta ; *Sinhalese* : Houdapara, Wampara ; *Taleing* : Carllow ; *Tamil* : Akku, Ugakkay, Uva, Uvav, Uvatteku ; *Telugu* : Kalinga, Peddakalinga, Uvva ; *Uriya* : Chalota, Oao, Ou, Rai, Uau.

Standardised plant name, U.S.A.—India Dillenia.

A

The genus was named by Linnaeus in honour of Johann Jacob Dillenius (1684-1747), a German botanist and professor at Oxford, author of important botanical works ; " Dillenia has of all plants the showiest flower and fruit ; Dillenius is likewise conspicuous among botanists " (Linnaeus, *Critica Bot.*, 80 : 1737). It comprises about 55 species. Dillenias are all tropical trees thriving in light sandy loam. The acid sepals and sweet carpels of many of them are eaten, either raw or cooked, and made into jellies and cooling drinks.

B

The *Dilleniaceae* are astringent and some are so used medicinally. The fruits of a very few are acidulous ; others are reputed tonic stimulants.

19. A tree of *Dillenia indica* in the People's Park, Madras.

20. Flower of *Dillenia indica* (about half natural size).

Indian Coral Tree

Erythrina indica

THE INDIAN CORAL TREE

1. ERYTHRINA INDICA *Lamarck*, Encycl. Meth. Bot. **2**, 391 (1788) ; Hooker f., Fl. Brit. India, **2**, 188 (1876).

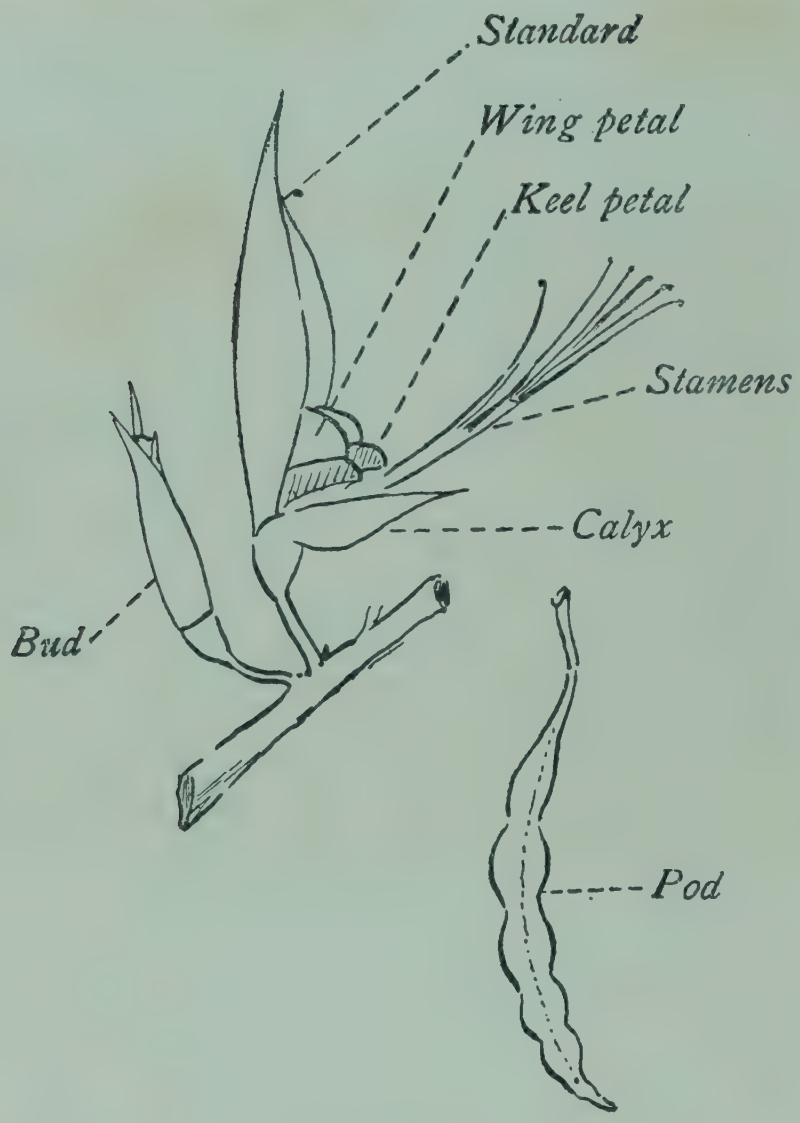
Description.—A moderate-sized tree, reaching 60 ft. in height, with a straight trunk and numerous branches. The branchlets are armed with small, dark-coloured conical prickles up to third or fourth year. The bark is thin, yellowish or greenish-grey, smooth, shining, with longitudinal whitish cracks. It exfoliates or peels off in papery flakes.

This figure illustrates the leaf, which is composed of three leaflets, the terminal one being the largest. The leaf stalks and leaves are without prickles. The leaflets

are covered with star-shaped hairs when young but are hairless when mature. The flowers, which are large and numerous, of a bright dazzling scarlet, growing in a single or in several racemes, at the ends of the branchlets, appear before the leaves and are arranged in clusters, one to three blooms emerging from a common stalk.

The diagram on the next page illustrates the composition of the flower and the appearance of the bud. The segments which form the calyx of the bud are fused

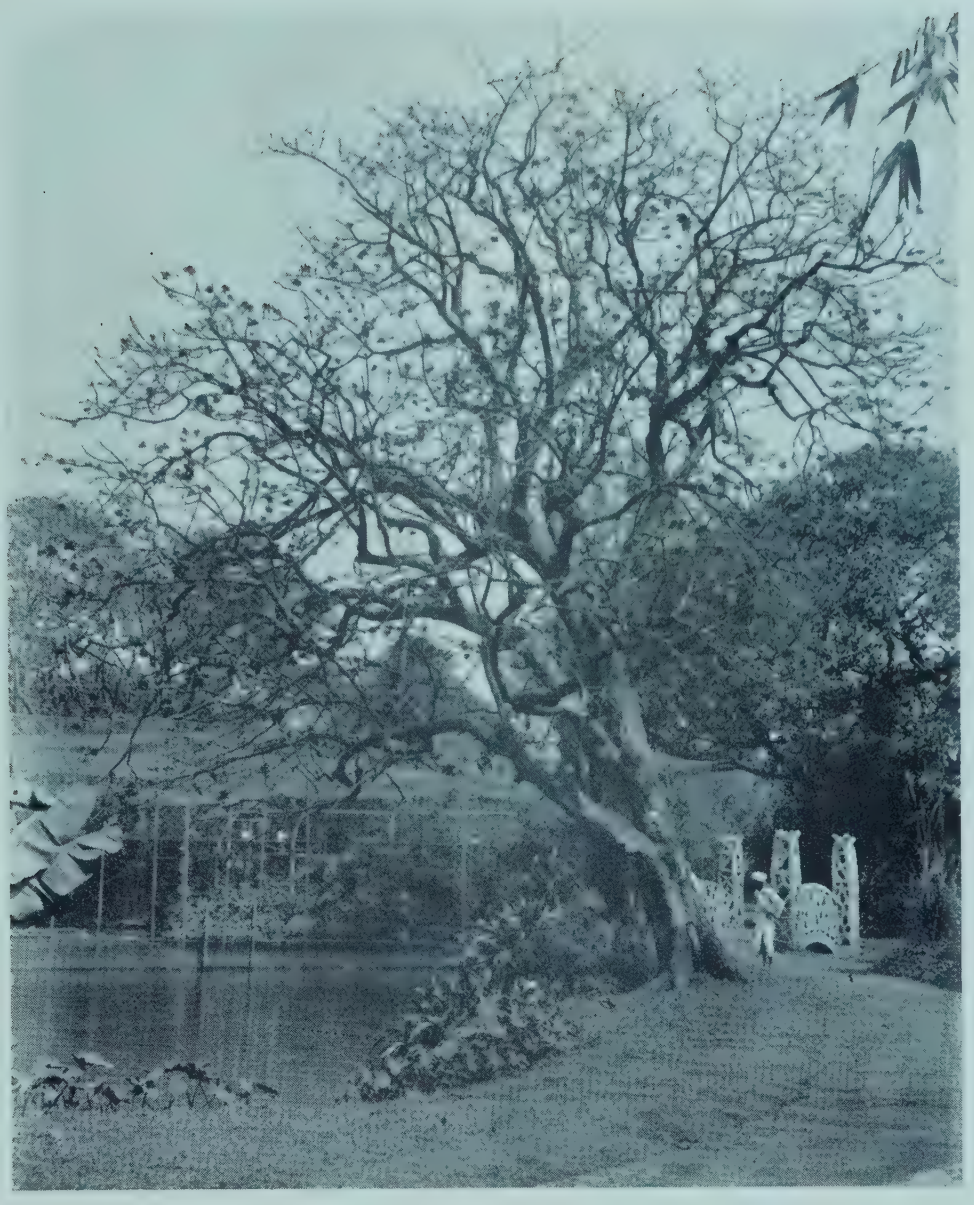
to form a tube which is narrowed at the apex and ends in 5 points, 2 of which are distinct and extend beyond the tip. When the bud opens the calyx splits down the back to the base and forms an open sheath. The corolla, it will be seen, is composed of 5 petals ; an erect, oblong standard which narrows at the base into a claw, two small



wing petals and two, almost similar-sized, keel petals of a distinctly darker hue. The wing petals partially enclose the keel.

The stamens protrude for almost their entire length. They are united into a bundle at the base ; higher up, the tenth stamen is distinct and free.

The pods, which are many, grow on a stout stalk and attain a length of 5 to 12 in. They are somewhat curved, constricted between the seeds, beaked at the tip, and



21. The Coral Tree in flower (*Erythrina indica*).

narrow down to a seedless base. When dry they are black and wrinkled. The pod contains from 1 to 12 seeds.

The seed is oblong, smooth ; its colour varies from red or dark red to purple or dark purple or brown.

In Vol. **33**, p. 460 (1929), of the *Journal of the Bombay Natural History Society*, Mr T. C. N. Singh has described how the Mynahs (*Acridotheres tristis tristis*) promote pollination of the flowers of the Coral Tree in Lucknow. The Editors have pointed out that in Western India a great variety of birds are regular visitors of the Coral Tree when in flower, contributing thus to its pollination. Among the birds to be invariably met with, in addition to the Mynah and the Crow, are mentioned the Rosy Starling (*Pastor roseus*), Babblers (*Turdoides*, *Pyctorhis*, and *Dumetia*), Drongo (*Dicrurus*), Wren Warblers (*Prinia socialis* and *inornata*), Tailor Bird (*Orthotomus sutorius*), Bulbuls (*Otocompsa*, *Molpastes*, *Pycnonotus* and *Chloropsis*), Grey and Black-headed Mynahs, Black-capped Blackbird (*Merula nigropileus*), and the Tree Pie (*Dendrocitta*).

Flowers from February to May before the young leaves appear.

Fruit ripens from May to July.

The old leaves are shed early in autumn.

Distribution.—Reported to be indigenous inland in deciduous forests of Thana, the Konkan, North Kanara and Malabar, and from the Sunderbunds along the coast through Arakan, Pegu, Tenasserim, the Andamans and Nicobars, Java, Polynesia. On the west coast it is found above high water, and, according to Talbot, sometimes associated with *Calophyllum inophyllum*, *Salvadora persica*, *Clerodendron inerme*, *Grewia microcos*, *Canavalia ensiformis*, *Derris uliginosa*. In the Andamans it grows together with *Mimusops littoralis*, *Calophyllum inophyllum*, *Thespesia populnea*, *Terminalia Catappa*, *Heritiera littoralis*, *Afzelia bijuga*, *Pongamia glabra* and *Hibiscus tiliaceus* (Troup). Haines thinks it may be wild in Khurda, where the tree is very common.

Otherwise this species is cultivated and self-sown all over India ; it occurs in hedgerows in Bengal.

Cultivation.—In Indian agriculture it has been employed

from the most ancient times as a shade tree. It was a universal belief that the soil benefits by its presence, and it has been known for centuries that other leguminous plants also have beneficent effects on the ground in which they have been cultivated. The Romans were aware of the fact that cereal crops grow better in soil which has been under vetches the year before, and they made use of the knowledge in their system of rotation. It was not until about 1887 that the nodules on the roots of leguminous plants were found to contain large numbers of a living organism often called *Bacterium radicicola* (a name covering several races of *Rhizodium*), which possesses the property of fixing atmospheric nitrogen.

The tree is much used in India for the support of betel pepper, black pepper, and grape vines ; also as a prop for the jessamine plant. In Reunion it is employed to support the vanilla. What renders the tree very proper for this purpose is its quick growth (from cuttings), its firm, permanent, smooth bark, which gives a strong hold to the roots of the vine, and, lastly, it is full of leaves and very shady during the hottest months of the year, so it shelters the vine from the intense heat of the sun and keeps the ground moist. As soon as the hottest weather is over, the leaves drop and expose the vine to the sun and weather during the cool season.

In some districts of Bengal the Betel-nut Palms are planted in groves of *Erythrina indica.* These enrich the soil and afford shade from the intense heat and protection from sudden wind storms. Coffee planters in Assam appreciate, for the same reason, several species of *Erythrina* (*E. indica*, *E. subumbrans* and *E. suberosa*). Also tea plantations derive advantages from the presence of *Erythrina.*

The Indian Coral Tree is adapted for ornamental purposes, and for making hedges and fences ; and, being armed with numerous prickles, it serves as an excellent hedge-plant to keep cattle from cultivated gardens.

The loppings are valuable as green manure.

It propagates readily from seeds or cuttings ; cuttings 6 ft. long by 3 in. across root readily when planted.

The following varieties or forms of *Erythrina indica* are grown in Indian gardens :—

Var. *picta* (L.) Blatter and Millard in Journal Bombay Nat. Hist. Soc. **33**, 628 (1929). Syn. *E. picta* Linnaeus (1753).

The leaves are variegated.

Var. *Parcellii* (Bull.) Blatter and Millard, l.c. (1929). Syn. *E. Parcellii* Bull. (1874).

Has leaflets with variable yellow variegation. The flowers are bright cinnamon-red.

This plant is very showy when young and is easily propagated by cuttings.

Var. *marmorata* (Planchon) Blatter and Millard, l.c. (1929). Syn. *E. marmorata* Veitch ex Planchon (1880).

It has large leaves attractively spotted with white.

Var. *alba* Blatter and Millard, l.c. (1929).

This is a white-flowered form. Nairne (*Flowering Plants of Western India*, p. 87) mentions it as occurring in Salsette, near Bombay. We have seen a specimen in the Victoria Gardens of Bombay.

Sir George Birdwood, in his book *Sva* (pp. 32-33), mentions that the white variety of the *pangri* (*Erythrina indica*) was first discovered near the ruined Hindu temple at Chembur (near Trombay, Bombay Suburban District) by a Mr Bhasker, the *karbhari* of the Victoria Gardens. He claims that he himself was responsible for propagating innumerable cuttings from this tree in the Victoria Gardens, Bombay, and for distributing them widely, even so far as Egypt.

According to him this was the only place in the world where the white variety existed, and seemed to him, for what reasons he does not state, " a distinct relic of the ancient Buddhists, who, as their grove at Lanouli (W. Ghats) shows, were enthusiastic arboriculturists."

In addition to the Victoria Gardens and other localities in Bombay, the white variety may, at the present day, be found growing in the Empress Gardens, and Bund Gardens, Poona, and in the native lines at Satara.

Economic value.—The tree yields a dark brown gum of little importance.

The bark is used in dyeing and tanning ; it yields an excellent cordage fibre of a pale straw colour.

The dried red flowers on being boiled yield a red dye.

The wood is light and soft, weighs 18 to 26 lb. per cubic foot, fairly durable, does not warp or split, particularly applicable to many purposes for which deal is employed. In India it is used for making scabbards, light boxes, toys, sieve frames, trays, planking, jars for household purposes, and ware to be covered with lacquer. Carpenters prefer it to all others for the poles of palanquins, and they generally employ it for the construction of rafts, fishermen's floats, canoes, and catamarans.

In Guam the wood is used for making troughs. In Samoa the natives use it for the outriggers of their canoes.

Domestic uses.—The tender leaves are eaten in curry. In the Trichinopoly district the leaves are used as a cattle fodder. In Indo-China they are commonly used to wrap minced meat. In Samoa the wood, when dead and dry, is used for keeping fire in the houses, as it will smoulder a long time without going out.

In Samoa and in other islands of the Pacific the natives reckon the change of seasons by the flowering of this tree.

Medicinal properties and uses.—Various parts of the tree are used by Ayurvedists. Sushruta recommends the plant for the treatment of snake-bite, but Mhaskar and Caius have shown experimentally that the root, the bark and the leaves are equally useless in the antidotal treatment of colubrine and viperine bites.

Popular beliefs.—The Indian Coral Tree is supposed to flower in Indra's garden. An episode in the Puranas relates the quarrels of Rukhmini and Satyabhama for the possession of the flowers which Krishna had stolen from the garden. The leaf is supposed to represent the Hindu trimurti ; the middle leaflet is Vishnu, on his right is Brahma, and on his left Shiva. The Portuguese have named them " Folhas da Trindade."

Vernacular names.—Bengal : Palitamadar, Palitamandar, Paltemandar ; *Berar* : Pangara, Pangra ; *Bicol* : Cabrab ; *Burma* : Kathit,

Pinlekathit ; *Cachar* : Madar ; *Canarese* : Bilivarijapa, Halivana, Halivara, Hongara, Hongaraka, Kempuvarijapa, Mandara, Mullumurige, Mullumutala, Nimbataru, Palivana, Parijata, Parivala, Parivana, Salaki, Varijapa, Warjipe ; *Cantonese* : Hoi T'ing ; *Chinese* : Hai T'ung ; *Cuba* : Piñon ; *Cutch* : Arduso ; *English* : Bastard Teak, East Indian Coral Tree, Indian Coral Tree, Mochi Wood, Red Bean Tree ; *Formosa* : Tz'u t'ung ; *French* : Arbre à pois cafre, Arbre au corail, Baracara, Bois de corail, Bois immortel, Bois rouge, Colorin, Cypre à corail, Erythrine au corail, Immortelle ; *French Guiana* : Erythrine à graine de corail, Immortelle ; *German* : Korallenbaum ; *Ghatwal* : Hadbad ; *Guam* : Gabgab, Gaogao, Gapgap ; *Gujerati* : Bangaro, Panaraweo, Panarvo, Panderavo ; *Hindi* : Mandara, Paltamandar, Pangara, Pangra, Panjira, Pharad ; *Ilocano* : Bagbag ; *Indo-China* : Thich dong, Vong, Vong nem ; *Kharwar* : Pharar ; *Kolami* : Birsing ; *Konkani* : Pangaro, Panghra ; *Lambadi* : Karakalli ; *La Reunion* : Nourouc, Pignon d'Inde de l'Inde ; *Magahi* : Katheik ; *Malaya* : Dapdap, Hoi ting ; *Malayalam* : Kalyanamurikku, Karimurikku, Kulmurikku, Mandaram, Murikku, Nimbataru, Paribhadram ; *Marathi* : Mandar, Pangara, Pangra, Pangaru, Phandra ; *Matheran* : Pangara, Paranga ; *Mundari* : Edelkirum, Kirum, Kirumedel, Sirumedel ; *Pampangan* : Dapdap, Sulbang ; *Philippines* : Bubug, Cosindic, Dapedape, Selbang, Telbong ; *Portuguese* : Folhas da trindade, Ponguero ; *Rarotonga* : Gatae, Ngatae ; *Samoa* : Gatae, Ngatae ; *Sanskrit* : Bahupushpa, Kantaki, Kantakinshuka, Krimighna, Krimishatru, Mandara, Nimbataru, Palasha, Palitmandara, Paribhadra, Parijata, Prabhadraka, Raktakeshar, Raktakusuma, Raktapushpa ; *Santali* : Marar, Mararbaha ; *Saora* : Baditi ; *Sinhalese* : Erabadu, Ettabadu ; *Spanish* : Arbol del coral ; *Tagalog* : Cabrab, Carapdap, Casindic, Dapdap ; *Tamil* : Kaliyanamurukku, Kavir, Muchi, Mullumurukku, Murukku, Palasam, Palasu, Parisadam, Savusayam, Sinsugam, Vallai, Venittu ; *Telugu* : Badida, Badisa, Badita, Baditi, Baridamu, Mahameda, Modugu, Muchikatta, Paribhadrakamu, Paribhavyamu, Parijatamu, Rohinamu ; *Tulu* : Pongare ; *Uriya* : Mondaro, Palodhua, Salotonya ; *Visayan* : Cabrab, Dapdap.

Standardised plant name, U.S.A.—India Coralbean.

A. Erythrina Linnaeus

(The name is derived from the Greek *erythros* "red," alluding to the colour of the flowers, which are mostly red.)

Erythrina is a genus of papilionaceous trees and shrubs, popularly known as Coral Trees, but also represented by herbs. About 50 species have been found in tropical and warm temperate regions. Some attain great dimensions, while others are dwarf bushes with a woody rootstock,

or even herbs. In many, the stems, branches and leaf-stalks are beset with prickles. The leaves consist of 3 leaflets, with the lateral leaflets opposite to each other. The flowers are large, mostly red, and arranged along a common stalk (raceme). The calyx is two-lipped or oblique (spathe-like). The standard is sessile or shortly stalked (clawed), upright or spreading, much larger than wings and keel. The stamens are united to the middle, the upper one free or united at the base with the rest. The anthers are equal and the style bent inwards. The fruit is a slender, stalked pod, constricted between the seeds, narrowed at both ends, opening more or less completely into 2 halves ; the seeds are mostly egg-shaped.

The Erythrinas are chiefly remarkable for their brilliantly coloured red flowers, which are usually produced before the new leaves are developed. They are much prized garden plants. The herbaceous species are propagated by division of the rootstock ; also by cuttings from shoots springing from the old roots. Woody species are propagated by cuttings of growing wood. All species are propagated by seeds, whenever these are obtainable.

In India 8 indigenous species have been observed ; 2 more have been introduced.

Key to the Indigenous Species

A. Trees
- I. Calyx spathe-like, oblique, splitting, not at all 2-lipped
  - 1. Calyx splitting to the base
    - (*a*) Tip of calyx 5-toothed . . 1. *E. indica.*
    - (*b*) Tip of calyx not toothed . . 2. *E. stricta.*
  - 2. Calyx splitting half-way down . . 3. *E. mysorensis.*
- II. Calyx bell-shaped, more or less distinctly 2-lipped, but not splitting down to the base
  - 1. Pod swollen, bearing seeds throughout the whole length
    - (*a*) Leaflets much longer than broad . 4. *E. fusca.*
    - (*b*) Leaflets as broad as long
      - *End-leaflet rhomboid or egg-shaped 5. *E. suberosa.*
      - **End-leaflet nearly kidney-shaped . 6. *E. arborescens.*
  - 2. Pod flat, seedless in the lower half . 7. *E. subumbrans.*

B. Undershrubs or herbs . . . . 8. *E. resupinata.*

2. ERYTHRINA STRICTA *Roxburgh*, Hortus Bengal. 53 (1814), name only, Fl. Ind. ed. alt. **3**, 251 (1832) ; Hooker f., Fl. Brit. India, **2**, 189 (1876).

A large or moderate-sized tree. Stems with a rougher bark than in *E. indica*. Bark pale, smooth, greenish after the papery exfoliation. Branches armed with numerous sharp, yellow or whitish prickles. Leaves with prickly stalks sometimes 6 in. long ; the two small leaflets at the base of the leaf-stalk sickle-shaped. Calyx $\frac{1}{2}$ in. long, entire at the tip, but splitting to the base down the back, almost hairless. Corolla bright scarlet. Pod 5 to 6 in. long, narrowed at both ends, slightly or not at all constricted between the seeds, compressed, stalked, hairless, often beaked with the slender style. Seeds 1 to 3, light brown.

Flowers.—January to May. The tree is without leaves up to the time of flowering.

Distribution.—Assam, Manipur, extending westwards to Nepal, Chittagong, Burma, Orissa, deciduous mixed forests of North Kanara and the Konkan.

Uses.—The wood is white, soft and spongy but tough and fairly durable, weighs about 20 lb. per cubic foot. It is used for fishing-net floats on the west coast of Madras, in the Bombay Presidency for scabbards, planking, and boxes to be covered with lacquer.

The flowers are said to be an antidote to poison.

Vernacular names.—Burma : Taung kathit ; *Canarese* : Hemmuruku, Kichige, Muruku ; *Lepcha* : Katiang ; *Malayalam* : Murikku ; *Nepalese* : Phullidha ; *Sanskrit* : Mura ; *Tamil* : Kinjugam, Mandaram, Mullumurukku, Murukku ; *Telugu* : Mullumoduga ; *Uriya* : Shalotonya.

3. ERYTHRINA MYSORENSIS *Gamble*, Fl. Madras, **1**, 354 (1918) and in Kew Bull. **1919**, 222.

A tree ; branchlets apparently without prickles. Leaf-stalk 4 in. long ; stalks of leaflets $\frac{1}{3}$ in. long. Leaflets almost leathery, broadly egg-shaped, abruptly long-pointed at the tip, terminal one 5 in. long, $3\frac{1}{2}$ in. broad, lateral ones 4 in. long and about 3 in. broad. Flowers fascicled towards the tips, scarcely $1\frac{1}{5}$ in. long, coral-red. Calyx split half-way down, minutely toothed above.

Nearly related to *E. stricta*, but the flowers are smaller; the wings and keel-petals are of the same length, *i.e.* ½ in.; the stamens are in two bundles.

It resembles *E. indica* in having the wings and keel-petals of equal length, but the flowers are much smaller and the leaves are different.

Flowers.—November.

Distribution.—Chickenalli in Mysore.

4. ERYTHRINA FUSCA *Loureiro*, Fl. Cochinch. 427 (1790).
Syn. *E. ovalifolia* Roxburgh, Hortus Bengal. 53 (1814), name only, Fl. Ind. ed. alt. **3**, 254 (1832); Hooker f., Fl. Brit. India, **2**, 189 (1876).

A moderate-sized tree. Trunk and branches armed with dark brown or black or pale-coloured and black-tipped, very sharp prickles, arising from pyramidal corky tubercles, and often extending even to the leaves and leaflets. Leaflets 3, much longer than broad. Racemes lax, 5 to 10 in. long, several at the ends of branchlets. Flowers crimson, mostly 3 in a fascicle. Calyx bell-shaped, splitting irregularly into 2 or more unequal divisions, hairy. Pod 6 to 8 in. long, swollen, bearing seeds throughout, constricted between the seeds at least on one side, finely downy, containing 6 to 8 seeds.

Flowers.—February to May.

Distribution.—Sylhet, Lower Bengal, Plains of Lower Burma, Ceylon, Malay Archipelago, Polynesia.

Popular names.—Bengal: Harikekra; *Burma*: Kon kathit; *Indo-China*: Vong dong.

In the southern portion of Indo-China this plant is used medicinally as a substitute for *E. indica.*

5. ERYTHRINA SUBEROSA *Roxburgh*, Hortus Bengal. 53 (1814), name only, Fl. Ind. ed. alt. **3**, 253 (1832); Hooker f., Fl. Brit. India, **2**, 189 (1876).

A middle-sized tree, 40 to 50 ft. high. Bark corky, deeply cracked. Branches numerous, crooked, spreading, armed with stout, conical, yellowish-white prickles $\frac{1}{10}$ to $\frac{1}{4}$ in. long, which fall off after the third year. Leaves of

3 leaflets, usually unarmed, but sometimes with a few scattered prickles on the stalks. Leaflets pale, 3 to 6 in. long and broad, sometimes broader than long, all more or less hairless above, matted with grey cottony hairs beneath. End-leaflet rhomboid or egg-shaped. Racemes 1 to 4, forming dense heads near the ends of the branchlets, 2 to 4 in. long ; calyx bell-shaped, soon becoming 2-lipped, not splitting to the base. Corolla scarlet. Upper stamen free from low down. Pod stalked, 5 to 6 in. long and $\frac{1}{2}$ in. in diameter, cylindrical, slightly constricted between the seeds, filled when young with spongy tissue between the seeds which finally drops out leaving the seeds attached to the margins of the grey shining valves. Seeds 2 to 5, pale brown or black, dull, kidney-shaped.

Flowers.—March to June. The pods ripen after May. The old leaves are shed during the cold season. The young leaves appear in March and April, generally shortly before the flowers open.

Distribution.—Wild in the Siwalik tract and lower Himalaya, from the Ravi to the Sarda, ascending to 3000 ft., occasionally found at 4000 ft., Oudh, Agra district, Merwara, Burma, Bihar and Orissa, North Circars, Central Provinces, Deccan in dry forests up to 3000 ft., throughout the forests of the Bombay Presidency, common in some of the Khandesh forests, up to 3700 ft. in the Akrani, not in the heavy rainfall zone, not uncommon in Southern India. Frequently cultivated.

Uses.—The wood is white, soft and light, but fibrous and tough. It weighs about 19 lb. per cubic foot. It is used extensively for scabbards, sieve-frames, jars for household purposes, and occasionally for planking. A good cordage fibre of a pale straw colour is obtained from the bark. The wood, ash and bark are employed for dyeing, and the bark is also used in medicine (Haines).

Two varieties are sometimes distinguished.

Var. *glabrescens* Prain in Journal Asiatic Soc. Bengal, **66**, ii, 410 (1897).

The leaflets are as in the type, but almost hairless beneath at an early stage. It can be distinguished from

E. stricta by the areoles of the leaves being less conspicuous and not white.

Distribution.—Hot valleys of the West Himalaya from Bashahr (up to 7000 ft.) eastward to Sikkim, also in Burma and on the Shan Hills.

Var. *sublobata* (Roxb.) Baker in Hooker f., Fl. Brit. India, **2**, 190 (1876) ; Syn. *E. sublobata* Roxburgh (1832).

The leaflets are variously lobed or notched, very hairy beneath.

Flowers.—At the end of the cold season. Seed ripens before the rains begin.

Distribution.—Parasnath, Hazaribagh, Monghyr, inland mountains in the Circars.

Vernacular names.—Almora: Rungra; *Berar*: Pangra; *Bhil*: Sambar; *Bombay* : Pangara, Pangra ; *Burma* : Kathit ; *Canarese* : Kaduparivala, Mulluhalivara, Mulluhongara ; *Deccan* : Pangara ; *English* : Corky Coral Tree ; *Garo* : Mandal ; *Gond* : Baldia, Phangera ; *Gujerati* : Jagriyokhakharo, Jangariokhakhro, Janghario ; *Hindi* : Dauldhak, Dhauldhak, Madar, Madara, Nasut, Pangara, Pangra ; *Melghat* : Nagthada, Nangthoda ; *Nepal* : Phullidha ; *Nimar* : Gadha palas ; *Oudh* : Nasut ; *Punjab* : Gulnashtar, Pariara, Thab ; *Tamil* : Mullumurukku, Munmurukku, Murukku, Vellaikkaliyanamurukku ; *Telugu* : Barijama, Barjapu, Mullumoduga, Munimoduga, Rohi, Rohitakamu ; *Uriya* : Bonopalodhua, Chaldua, Mushkombhu, Paldua, Salotonya.

6. Erythrina arborescens *Roxburgh*, Pl. Coromandel, **3**, 14, t. 219 (1811), Hortus Bengal. 53 (1814), Fl. Ind. ed. alt. **3**, 256 (1832) ; Hooker f., Fl. Brit. India, **2**, 190 (1876).

A low tree. Trunk straight, with no more than two or three simple ascending branches, armed with a few, scattered, small, sharp prickles, otherwise smooth in every part. Leaflets entire, smooth above, whitish underneath, the end one nearly kidney-shaped. Flowers many, large, of a vivid scarlet, in threes, stalked, drooping over each other in an elegant way. Calyx entire, bell-shaped, coloured. Standard almost egg-shaped, boat-shaped, hanging over the rest of the flower. Pod much curved, $\frac{1}{2}$ to $\frac{3}{4}$ ft. long, 1 in. or more broad, 4 to 6 seeded.

The flowers resemble those of *E. suberosa*, but the calyx is larger and the limb of the standard broader.

Flowers.—August to October. The flowers appear together with the leaves.

Distribution.—Outer Himalaya from the Ganges to Sikkim at elevations between 4000 and 7000 ft., Melghat Berar, Khasia Hills. Occasionally planted in Sind and elsewhere.

The wood is similar to that of *E. suberosa* and *E. indica*, but is more compact, less spongy, and has more numerous concentric bands of soft texture.

Vernacular names.—Khasia : Dingsong ; *Kumaon* : Mandiara, Rungara ; *Lepcha* : Gyesa ; *Nepalese* : Phullidha, Rodinga.

Standardised plant name, U.S.A.—Himalayan Coralbean.

7. ERYTHRINA SUBUMBRANS (*Hassk.*) *Merrill* in Philipp. Journal Sci. Bot. 5, 113 (1910).

Syn. *Erythrina lithosperma* Blume ex Miquel, Fl. Ind. Bat. 1, 209 (1855) ; Hooker f., Fl. Brit. India, 2, 190 (1876), non Blume ex Hasskarl, Pl. Jav. Rar. 381 (1848)—*Hypaphorus subumbrans* Hasskarl, Hortus Bogor. Descr. sive Retziae Ed. Nova, 182 (1858)—*Erythrina Hypaphorus* Boerlage in Teysmannia, 5, 20 (1894).

A tall tree, reaching a height of 45 ft., with or without a few straight sharp prickles. Leaflets membranous, dark green, egg-shaped, long-pointed, 4 to 6 in. long. Racemes of flowers appearing with the leaves, hairy, about 4 in. long. Calyx velvety, finally splitting down nearly to the base in two lips. Petals red, the standard about 1½ in. long, keel and wings less than half the length of the standard. Pod much bent back, 4 to 5 in. long, flat, seedless in the lower half, bearing 1 to 3 seeds at the tip.

Flowers.—January, February.

Distribution.—Burma, in moist valleys near streams up to 3000 ft., Indo-China and Malaya.

Uses.—Often grown to support the betel-vine.

" This tree is universally employed in the Java plantations as a shade tree for coffee, and, with *E. umbrosa* H. B. K. from Central America and *E. velutina* Willd. from the W. Indies, is used for the same purpose over cocoa in Ceylon " (Gamble).

This thornless evergreen tree is known in Burma as "yekathit." It is very ornamental while in flower, during the rainy season. It is easily raised from seed.

8. ERYTHRINA RESUPINATA *Roxburgh*, Pl. Coromandel, **3**, 15, t. 220 (1811), Hortus Bengal. 53 (1814), Fl. Ind. ed. alt. **3**, 257 (1832); Hooker f., Fl. Brit. India, **2**, 189 (1876).

Though this species is not a tree, but a herb or undershrub, we include it here because it is one of the curious dwarf representatives of otherwise tree-producing genera. Similar instances occur in *Ochna*, *Grewia*, *Combretum*, *Careya* and *Premna*. Gamble was of the opinion that they "have become definite species through years of regular burning of the above-ground stems."

Description.—An undershrub with a perennial rootstock. Shoots a few inches high, dying down annually. Leaf-stalks long, prickly. Leaflets 2 to 3 in. long and broad, round-heart-shaped, entire, nerves beneath sometimes prickly. Racemes direct from the rootstock, under 1 ft. high, dense and many-flowered, often appearing before the leaves; stalk prickly. Flowers bright scarlet, large, in threes. Calyx 2-lipped, bell-shaped. Standard oblong, 3 to 4 times the length of the calyx, keel half as long as the standard, tinged with red; wings much shorter, greenish. Upper stamen free from low down. Pods stalked, about 3 in. long, flat, 3-seeded, constricted between the seeds.

Flowers.—The flowers are produced in March after the fires of the hot season, and present a very beautiful appearance. After the flowers appears a short herbaceous stem which withers after the rains.

Distribution.—Savannahs of the sub-Himalayan tract from Oudh and Gorakhpur eastward, also on Parasnath.

INTRODUCED SPECIES

ERYTHRINA CRISTA-GALLI *Linnaeus*, Mantissa, **1**, 99 (1767).

Bushy and woody, sometimes developing a very short trunk, but the flowering branches dying back after blooming, the stronger branches arising annually or

periodically from near the root. Stem and leaf-stalks somewhat spiny. Leaflets egg-shaped, oblong or lance-oblong, long-pointed, entire. Flowers large and crimson ; keel nearly as long as the down-folding standard ; wings rudimentary.

This plant runs into many forms, varying in the shade of red, some of them with variegated leaves.

It is a native of Brazil and has been introduced into Indian gardens.

According to Woodrow, it thrives in any fair garden soil in the dry districts, and is easily propagated by cuttings.

Plants, when in flower, do not seem to merit the high praise bestowed upon them by their admirers. The rather dull crimson flowers are not nearly so fine in colour as some of the foregoing, but they look more ornamental, the plant being in full leaf at flowering time.

Standardised plant name, U.S.A.—Cockspur Coralbean.

ERYTHRINA BLAKEI hort. ex *Parker*, Forest Fl. Punjab, 159 (1918) ; Blatter and Millard in Journal Bombay Nat. Hist. Soc. **33**, 631 (1929).

A small tree or large shrub ; bole thick and crooked ; branches massive, spreading ; bark grey, smooth ; prickles very few. Leaflets round or egg-shaped, long-pointed, hairless, 3 to 4 in. long. Racemes terminal, leafy below with distant flowers, densely flowered above. Calyx bell-shaped, slightly 2-lipped, hairless. Corolla dark scarlet, 2 in. long ; standard $\frac{4}{5}$ in. broad ; keel less than half as long as the standard ; wings narrow-oblong, as long as the keel or nearly so.

Parker says that this plant is cultivated in gardens all over Northern India under the name given above. He thinks it might be a hybrid or form of the American *E. herbacea* Linn.

It is a rare plant, considered the most beautiful of the genus, bearing in April flowers of the most brilliant scarlet colour.

B. Legumes

Legumes is the popular name given to the important group of plants forming the *Leguminosae*, which in J. Hutchinson's classification (see p. 145) is treated as an Order comprising three Botanical Families, *i.e.* the herbs, shrubs, vines and trees of the Mimosa family (*Mimosaceae*), the Senna family (*Caesalpiniaceae*) and the Pea family (*Papilionaceae*). The group is a large one, containing between 9000 and 15,000 species. For many purposes its division into three families is convenient, but the better policy may be to follow the *Flora of British India* and regard them as three sub-families (i.e. *Mimosoideae*, *Caesalpinioideae* and *Papilionioideae*). There are a few genera which blur the distinctions between them by possessing more or less intermediate combinations of characters. Members of the *Leguminosae* occur in all parts of the world but are especially abundant in tropical countries.

The *Mimosaceae* have not been illustrated in this book but include nevertheless a number of beautiful trees, among them the Saman, Guango or Rain Tree, *Samanea Saman* (Jacq.) Merrill, also known as *Enterolobium Saman* (Jacq.) Prain. It is a native of Venezuela and Colombia but is often planted in India and other tropical countries. It grows fast and makes a rounded spreading tree up to 70 feet high with large evergreen bipinnate leaves. The individual flowers are small but attractive, being clustered and having numerous long pink and white stamens. Unfortunately, the wood has no value.

THE COLOURED STERCULIA

FIRMIANA COLORATA (*Roxb.*) *R. Brown* in Bennett and Brown, Pl. Javan. Rar. 235 (1844).

Syn. *Sterculia colorata* Roxburgh, Pl. Coromandel, **1**, 26, t. 25 (1795) ; Hooker f., Fl. Brit. India, **1**, 359 (1874)—*Erythropsis Roxburghiana* Schott and Endlicher, Meletemata Bot. 33 (1832)—*Erythropsis colorata* (Roxb.) Burkill in Straits Settlem. Gdns. Bull. **5**, 231 (1931).

The genus *Firmiana* comprises about ten species, *F. colorata*, *F. fulgens* and *F. pallens* being Indo-Malayan.* It commemorates an Austrian statesman, Count Karl

* In a dried state the above three Asiatic species of *Firmiana* subgenus *Erythropsis* may be distinguished by calyx characters. *F. colorata* has a narrow coral-red calyx about $\frac{7}{10}$ in. long, the mouth about $\frac{1}{5}$ in. across, *F. fulgens* (Masters) Corner likewise a narrow bright-coloured (orange-red) but longer calyx about $1\frac{1}{5}$ in. long, $\frac{3}{10}$ in. or so across the mouth, *F. pallens* (Ridley) a more campanulate light-coloured (yellowish, not red) calyx about $\frac{3}{5}$ to $\frac{4}{5}$ in. long, $\frac{4}{10}$ in. across the mouth. *F. fulgens* is recorded from Burma, Siam, Penang, Perak and Sumatra but does not grow wild in India. *F. pallens* appears confined to India. For detailed descriptions of *F. fulgens* and *F. colorata* see King in *Journal Asiatic Soc. Bengal*, 60, ii, 71-73 (1891) ; for *F. pallens* (syn. *Erythropsis pallens*) see Ridley in *Kew Bull.* **1934**, 216.—W.T.S.

Joseph von Firmian (1716-1782), a patron of the Padua botanic garden. Giovanni Marsigli published it in 1786 ; Schott and Endlicher gave it generic recognition in 1832 but many botanists include it in *Sterculia*. It is distinguished by its membranous follicles, which open long before maturity and have only one or two marginal seeds ; *Sterculia* has leathery follicles with several marginal seeds.

A very conspicuous tree when in flower from March to May. The tree is leafless at this period and the branches

and twigs are covered with coral-red flowers and, as these fade, their place is taken by the winged leaf-shaped follicles which are pink at first and turn red later. These bear on the edges one or two seeds. The tree is fairly common at Khandalla on the Western Ghats and there used to be a few trees growing in Bombay fairly recently.

Description.—A large tree with a straight, sometimes fluted trunk covered with thick, scaly, ash-coloured bark and a crown of spreading branches. The leaves are crowded together at the ends of the branches. They grow on slender stalks 4 to 12 in. long. The leaf is broader than long ; it measures 4 to 8 in. in length and is from 5 to 12 in. in width. It has 3 to 5 points formed by shallow triangular lobes which taper acutely towards

Coloured Sterculia

Firmiana colorata

22. The Coloured Sterculia (*Firmiana colorata*) in flower.

C. McCann

23. Flowers of the Coloured Sterculia (*Firmiana colorata*).

the tips. In the older trees the number of these lobes is usually three, but in the younger plants and seedlings the number of points is increased. Young leaves and shoots are always downy. The older leaves are smooth on both surfaces ; *F. fulgens* has them hairy. The tree commences to shed its leaves in November and is leafless from January to April, when the young leaves commence to sprout. This generally takes place after the tree has burst into flower. The Coloured Sterculia is then a conspicuous and brilliant sight. In the forests of the Western Ghats and the Deccan where the tree is common these trees in flower appear on the hill sides and in the ravines like masses of flaming red coral. The flowers grow in short dense panicles at the ends of the branches. Their colour varies from bright coral or orange-red to greyish-brown. The stalks, the flowers and the stem on which they grow are covered with fine downy hairs, giving the whole inflorescence a soft, velvety appearance. The calyx is narrowly funnel-shaped, and about $\frac{3}{4}$ in long, the column of the united stamens protruding from this and bearing at its summit about 30 yellow anthers. There are no petals. The stigmas are short and recurved. The interior of the flower is deep red. The fruits are numerous and conspicuous and might be mistaken for leaves. The fruit is composed of from 2 to 5 leaf-like membranous valves growing on a common stalk. These valves are green or pinkish on the outside and yellowish within. They open long before the fruit is mature, revealing usually two yellow, much wrinkled seeds the size of a small bean, adhering one to each margin of the valve.

Flowering season.—March to May. Fruits, May to June. New leaves, April to May.

Distribution.—Satpuras up to 3700 ft. ; West Ghats from South Kanara to Travancore, Konkan and Deccan Forest, North Circars, Mount Abu, East Bengal, Burma, Andamans, Ceylon, Indo-China, Siam, Hainan.

Economic value.—The bark yields an inferior kind of fibre, strong but coarse, which is sometimes made into ropes.

The wood is dingy, greyish-white in colour, very soft, marked with conspicuous medullary rays.

The twigs and leaves are used in the Western Peninsula as a cattle fodder.

Domestic uses.—The flowers are used in some parts of the country, such as the Berars, to decorate the horns of cattle during the Holi Festival.

Vernacular names.—Andamans : Berda ; *Bengal* : Mula ; *Berar* : Khowsey, Pinj ; *Bombay* : Bhaikoi, Bheckhol, Samarri, Walena ; *Burma* : Wetshaw, Yasengshaw ; *Canarese* : Bilisulige ; *Garo* : Bolazong ; *Hindi* : Bodula, Samarri, Walena ; *Kharwar* : Lersima ; *Kolami* : Pisi, Sisi ; *Kumaon* : Bodal, Bodala ; *Lambadi* : Kodokili ; *Lepcha* : Kanhlyen ; *Malayalam* : Malamparatti ; *Merwara* : Mutruk ; *Nepal* : Omra, Phirphiri, Sitto udal ; *Saora* : Kodijuttu ; *Tamil* : Malambarutti ; *Telugu* : Gudilapu, Karaka, Karuboppayi, Karupayu, Karuchichche, Kondatamara.

Sterculiaceae

They consist of tropical South African or Australian herbs, shrubs, or trees furnished sometimes with large and handsome flowers, such as *Sterculia* and *Kleinhovia.*

The name *Sterculia* is from Sterculius of Roman mythology, derived from *stercus*, dung. The Romans at the height of paganism deified the objects of their greatest dislike and most immoral actions. Thus they had the gods Sterculius and Crepitus, and the goddesses Caca and Petunda. The flowers and leaves of some species of *Sterculia* are ill-smelling.

Plate XV

Brilliant Gardenia

Gardenia resinifera

THE BRILLIANT GARDENIA

GARDENIA RESINIFERA *Roth.*, Novae Pl. Sp. 150 (1821).

Syn. *Gardenia lucida* Roxburgh, Hortus Bengal. 15 (1814), name only, Fl. Ind. **2**, 553 (1824), ed. alt. **1**, 707 (1832); Hooker f., Fl. Brit. India, **3**, 115 (1880).

The genus *Gardenia* belongs to the family *Rubiaceae*. It is named after Dr Alexander Garden (*c.* 1730-1791) of Charleston, South Carolina, U.S.A. *Resinifera* means "resin-bearing."

Description.—A large smooth shrub or small tree reaching 20 to 25 ft. in height. The bark is smooth and

grey, when young greyish-green. Shoots are smooth and shining and covered with a thin yellowish coating of resin which frequently forms globules at the tips. The leaves are from $2\frac{1}{2}$ to 8 in. long by 1 to 3 in. broad. They are elliptic-oblong in outline, with partially blunt or fine-pointed tips. The base of the leaf is narrowed into the short leaf-stalk. The slender main nerves of the leaf are

prominent on the underside. The stipules between the opposite leaves are large, broadly egg-shaped, pointed

and thin in texture. The flowers are large and fragrant. They rise singly in the axils of the uppermost leaves near the extremities of the branches ; the flower stalks vary

from $\frac{1}{4}$ to $\frac{1}{2}$ in. in length. The calyx is $\frac{3}{4}$ in. long and softly hairy ; the teeth are $\frac{3}{8}$ in. long, erect, lance-shaped and tapering to a fine point. The corolla is large, pure

24. Flowers of the Brilliant Gardenia (*Gardenia resinifera*).

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25. A tree of the Brilliant Gardenia (*Gardenia resinifera*).

white on opening, soon turning yellow ; the tube is $1\frac{1}{4}$ to 2 in. long, slender, covered with fine hairs on the outside. The five petals are obovate, blunt, $1\frac{1}{4}$ to $\frac{3}{4}$ in., spreading, veined and smooth. The fruit is elliptical or rounded in outline, $\frac{3}{4}$ to 1 in. in diameter, smooth, marked with longitudinal lines and crowned by the persistent calyx ; the outside is thick and woody. The flowers open in the evening, soon turn from white to yellow and die (Cooke).

Distribution.—Growing wild in Burma, Chittagong, from the Konkan southwards, North Kanara, Deccan and Carnatic, in deciduous forests in all the dry districts of the Madras Presidency.

Economic value.—The remarkable gum-resin, *dikamali*, or *cumbi*-gum, is obtained from this species and from *G. gummifera* Linn. f. The exudation from both species is apparently identical, and in both cases forms transparent tears from the extremities of the young shoots and buds. These shoots and buds are broken off with the drops of gum-resin attached, and exposed for sale either in this form, or after agglutination into cakes or irregular masses.

Commercial *dikamali* is sold either in the form of the twigs coated with and agglutinated by the gum-resin, or as irregular earthy-looking masses of a dull olive-green colour which consist of the resin more or less mixed with bark, sticks, and other impurities. It has a peculiar and offensive odour like that of cats' urine. When carefully collected and free from impurity it is transparent and of a bright yellow colour.

The wood is yellowish-white, close-grained, hard, containing no heartwood, weight 39 lb. per cubic foot. It is useful for turning, and is employed for making combs by the natives.

Domestic uses.—The fruit is an article of food in the Central Provinces.

Medicinal properties and uses.—Ainslie in his *Materia Indica* writes : " Cumbi-pisin or cumbi-gum is a strong-smelling gum-resin, not unlike myrrh in appearance, and possessing, the Hakims say, nearly similar virtues ; it is, however, far more active, and ought, on that account, to be administered in very small doses ; as an external

application, it is employed, dissolved in spirits, for cleaning foul ulcers, and, where the balsam of Peru cannot be obtained, might be used as a substitute for arresting the progress of sphacelous and phagedenic affections, which that medicine has the power of doing (at least in hot climates) in a very wonderful manner." The drug is considered anti-spasmodic, carminative and when applied externally, antiseptic and stimulating. It is accordingly employed by the natives of Southern and Western India, in cases of hysteria, flatulent dyspepsia, and nervous disorders due to dentition in children, also externally as an application to foul and callous ulcers, and extensively to keep away flies from sores. It has also been employed in European practice for the last purpose with marked success, both in hospitals and in veterinary work, and is said to be a successful anthelmintic in cases of round-worm (Watt).

" The gum of the tree melted in oil is applied to the forehead to check headache " (V. Ummegudien, Madras).

Gardening.—For sowing it is preferable to separate the numerous seeds, though in nature a whole fruit will rot and the seeds germinate in a heap. The seedlings do best in partial shade (Haines). It can also be propagated by cuttings in the rains.

Vernacular names.—*Berar* : Dikamali ; *Bijeragogarh* : Papar ; *Bombay* : Dekamali ; *Canarese* : Bikke, Dikkamalli ; *Central Provinces* : Kokkita, Kondamanga, Kuru, Tettamanga ; *English* : White Emetic Nut ; *Gujerati* : Dekamari, Dikamali ; *Hindi* : Dekamali, Dekamari, Dikamali ; *Kathiawar* : Malan, Malati ; *Konkani* : Dikamali ; *Koya* : Karangi ; *Marathi* : Dekamari, Dikamali ; *Porebunder* : Bhaladi, Bhalan ; *Sanskrit* : Hingu, Hingunadika, Jantuka, Nadi-hingu, Palashakhya, Pinda, Pindavha, Ramathi, Shivadika, Suvirya, Vanshapatri, Venupatri ; *Tamil* : Kambil, Kumbai, Tikkamalli ; *Telugu* : Bikki, Erubikki, Karinguva, Sinnakaringuva, Tellakaringuva, Yettabikki ; *Tulu* : Dikkamalli.

THE SPOTTED GLIRICIDIA

GLIRICIDIA SEPIUM (*Jacq.*) *Walpers*, Repert. Bot. Syst. **1**, 679 (1842) ; Hubbard & Rehder in Harvard Bot. Mus. Leafl. **1**, 6 (1932).

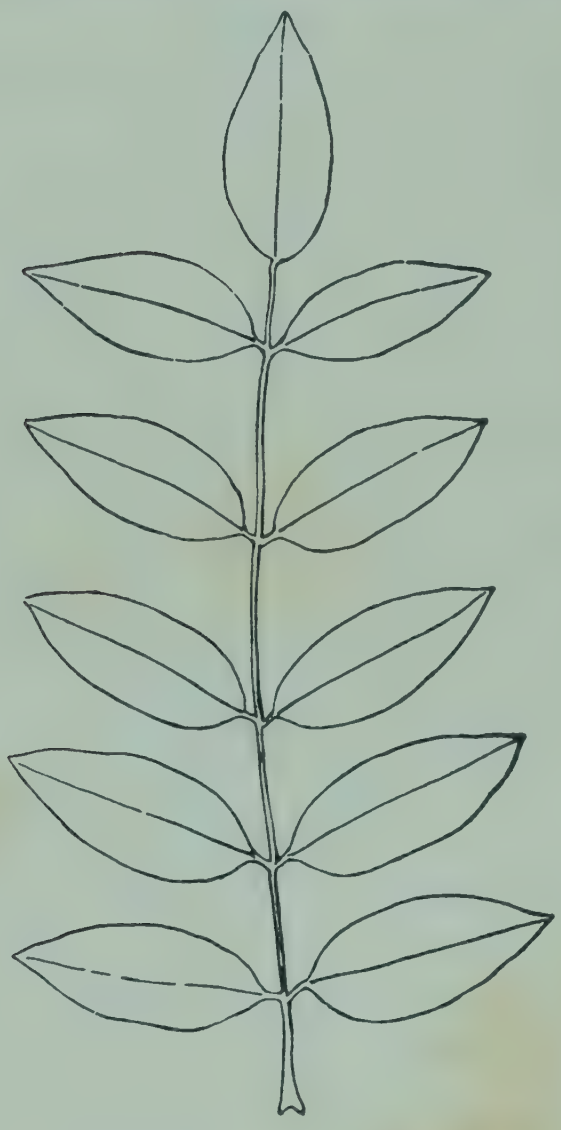
Syn. *Robinia sepium* Jacquin, Enum. Pl. Carib. 28 (1760)—*Lonchocarpus sepium* (Jacq.) De Candolle, Prodr. **2**, 260 (1825).

The generic name *Gliricidia* means " dormouse-destroyer " (from *glis*, genitive *gliris*, " dormouse," *caedo* " kill ") and was coined by Jacquin simply as a Latin rendering of the vernacular name " Mata-raton " used at Cartagena, Colombia. Later Humboldt and Bonpland found the powdered bark of *Gliricidia* mixed with grains of maize (*Zea Mays*) in use at Campeche, Mexico, as a poison for mice and rats. According to Standley, the leaves as well as other parts of the plant are poisonous to these rodents and he confirms the statement of Humboldt, Bonpland and Kunth by noting that to-day " the seeds or powdered bark mixed with rice, etc. are used in tropical America for poisoning rats and mice " (*Contrib. U.S. Nat. Herb.*, **23**, 482 ; 1922). The epithet *sepium* means " of hedges." The name *Gliricidia maculata* (Humb., Bonpl. and Kunth) Steudel has also been used for this plant.

Description.—A small elegant and quick growing tree with arching branches and feathery foliage somewhat reminiscent of the Cassias. The leaf is described as odd-pinnate, the leaf-stalk bearing 8 pairs of pinnae or leaflets and with an odd terminal leaflet. The leaflets are oblong in shape, acute or almost acute at the tip, softly hairy when young, ultimately glabrous above but hairy along the veins below, and dull green ; the black spotting on the under surface of the leaves gives the tree its common name. The tree sheds almost all its leaves during the cold weather when it flowers.

It is strikingly beautiful in bloom when its branches for the greater part of their length are covered with masses of pinkish-purple or pale pink flowers. The

flowers grow in clusters. The calyx of the flower is cup-shaped with a slightly 5-lobed rim. The petals consist of a large erect backward-curving standard petal, 2 sickle-shaped wing-petals and an incurving keel-petal. The two-valved pod is long and flat with a thickened margin.



Flowering season.—In Bombay these trees usually flower in February and March.

Gardening.—The Spotted Gliricidia is easily raised from seed or cuttings, which should be 5 to 6 ft. long and planted 12 ft. or more apart. The tree bears such a heavy crop of leaves that the branches are frequently broken by the wind, especially as the wood is very brittle, and it is better to pollard the tree from time to time.

Uses.—Macmillan states that the rapid growth of the tree and its long leafy branches recommend it as a useful

26. Flowers of the Spotted Gliricidia (*Gliricidia sepium*).

Spotted Gliricidia

Gliricidia sepium

shade tree for crops and for green manuring. The whole tree is rich in nitrogen, the flowers alone containing up to 3·36 per cent. The dried leaves smell like new-mown hay.

Distribution.—Guatemala to South America. It was introduced into Ceylon from the West Indies about 1899. At a meeting of the members of the Bombay Natural History Society held on 29th September 1916, Mr Millard exhibited a young specimen of this handsome flowering tree which he had raised from seed received from the Peradeniya Gardens through the kindness of Mr Macmillan the Curator, and this was probably the first introduction of this tree into Bombay.

It is grown as a permanent shade tree for Cacao in Nicaragua, Trinidad, the West Indian Islands, and many parts of the tropics. It is cultivated in Old Calabar streets as a shade tree.

Vernacular names.—*English* : Madre of Cocoa, Madura Shade Tree, Mother of Cocoa, Nicaraguan Shade Tree ; *Nicaragua* : Madera, Madura.

THE LIGNUM VITAE TREE

GUAIACUM OFFICINALE *Linnaeus*, Sp. Pl. 1, 381 (1753).

The generic name is derived from the Spanish one, *guayacan* or *guayaco*, which itself originated from *hoaxacan*, the Mexican appellation of the plant.

The specific name *officinale* means " officinal," " used of medicinal or other plants procurable at shops " ; or " used or recognized in pharmacy or medicine."

Description.—The Lignum Vitae Tree grows to a height of 30 to 40 ft. The stem is generally crooked, the wood intensely hard, the branches knotty and the bark deeply furrowed.

The dense crown of close-growing foliage gives the tree a rounded, compact, neat appearance. It is distinctly ornamental on a lawn. Each leaf is composed of two or three pairs of smooth, stalkless leaflets arranged on a slender mid-rib. The leaflets are $\frac{1}{4}$ to $\frac{1}{2}$ in. in length. There is much irregularity both in their size and shape : some are broadest above the middle (obovate), some almost blunt (obtuse).

The tree flowers at the end of the cold season and the commencement of the hot weather. In Bombay some of the trees are in bloom the whole year round. The beautiful blue flowers grow in great profusion. They almost cover the tree. The flowers remain for a long

Lignum Vitae Tree

Guaiacum officinale

27. The Lignum Vitae Tree (*Guaiacum officinale*).

C. McCann

28. Flowers of the Lignum Vitae Tree (*Guaiacum officinale*).

time. As the older blooms fade from deep blue to paler shades, some becoming almost white, a striking variegation of colour is produced. The flowers grow in clusters at the ends of the branches. Each flower has five petals cupped in a small finely hairy calyx, supported on a slender stalk. There are ten stamens bearing golden-yellow anthers.

The fruit appears as small, round, compressed yellow capsules, containing 5 cells ; occasionally there are fewer. Each cell encloses a single seed.

Distribution.—The Lignum Vitae Tree is an inhabitant of the islands of the West Indies, whence it has been introduced into India. It also grows in the arid plains stretching from the Florida Keys to Venezuela.

Gardening.—Raised from seed. For many years we knew of only one tree in Bombay which was growing in the compound of the Jamsetjee Jejeebhoy Hospital. This had been introduced, we were told, by Dr Wellington Gray, from the West Indies. Seeds were obtained from this tree by the late Mr H. V. Kemball and now it is a fairly common tree in gardens in Bombay. It succeeds well at Madras and Bangalore, though at the latter station it is rare and somewhat stunted in growth.

Uses.—The wood, called Lignum Vitae (Pockholz or Franzosenholz by the Germans) reached Europe *via* Spain probably towards the end of the fifteenth century. Soon it became famous as a remedy against the " Morbus Gallicus," and was praised as such in numerous books, of which the most important is Ulrich von Hutten, *De Guaiaci medicina et morbo gallico liber unus*, Moguntiae (1519). The heartwood is greenish-brown, the sapwood pale yellow. It is remarkable for the direction of its fibres, each layer of which crosses the preceding diagonally. It sinks in water. It is of great value and is used for many purposes, chiefly by turners. Ship's blocks, rulers, pulleys, skittle-balls and bowls are among articles made of it. When rubbed and heated, it gives off a faint, disagreeable aromatic odour. Its taste is pungent and aromatic. Shavings and raspings of the wood are used by apothecaries for medicinal purposes. In the same way the bark is employed in medicine. The most

important product is a resin obtained from the wood and bark, and used in powder, pill and tincture. It is an acrid stimulant and has been found efficient against various diseases. The resin is an ingredient of the well-known Plummer's Pills. It is also one of the chief means employed to detect bloodstains.

The resin sometimes flows spontaneously from the stem of the tree ; at other times, it is obtained artificially by jagging or notching the stem and allowing the exuding juice to harden, or by boring holes in logs of the wood and then placing them on a fire so that the resin is melted and runs through the hole, or by boiling the chips in salt and water, when the resin floats on the surface of the water.

The resin is greenish-brown in colour and has a brilliant resinous fracture. Of taste there is scarcely any, but it leaves a burning sensation in the mouth.

Vernacular names.—Danish : Frazostraee ; *Dutch* : Pokhout ; *English* : Guaiacum, Lignum Vitae Tree ; *French* : Bois saint, Gaïac, Gayac ; *German* : Franzosenholz, Guayakholz, Pockenholz ; *Italian* : Guajaco, Legno guajacano, Legno santo ; *Portuguese* : Guyaiaco ; *Russian* : Bakaut ; *Spanish* : Guayacan, Guayaco, Leño santo, Palo santo, Palo santo de las Indias ; *Swedish* : Fransosenholts.

Standardised plant name, U.S.A.—Common Lignumvitae.

A. Guaiacum Plumier ex Linnaeus

The genus contains 10 species of trees or shrubs, all indigenous to tropical America. They are noted for the resin which they secrete, and the extreme hardness of their wood.

B. Zygophyllaceae

The family name is derived from the Greek and alludes to the numerous pairs of leaflets, *zygon* = yoke + *phyllon* = leaf. The family consists of 22 genera and about 160 species, mostly natives of the warm regions in the northern hemisphere ; they principally inhabit the extra-tropical and hot regions of both hemispheres, especially abounding from the north-west of Africa, through the Mediterranean region, to the northern limit of India ; they are rarer in South Africa, Australia and South America.

Mimosa-leaved Jacaranda

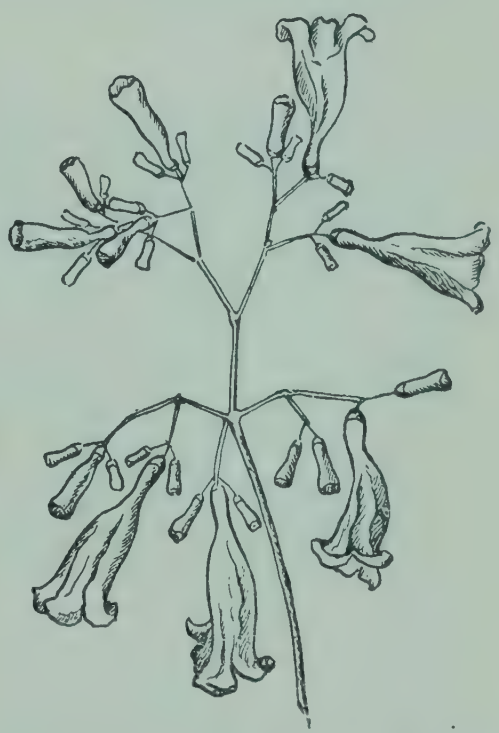
Jacaranda mimosifolia

THE MIMOSA-LEAVED JACARANDA

JACARANDA MIMOSIFOLIA *D. Don* in Bot. Reg. **8**, t. 631 (June 1822), Edinburgh Phil. Journal, **9**, 266 (1823).

Syn. *Jacaranda ovalifolia* R. Brown in Bot. Mag. **49**, t. 2327 (June 1822)—"*J. acutifolia*" avet. ; cf. Sandwith in Kew Bull. 1953, 456 (1954).

Jacaranda is a Brazilian vernacular name first mentioned in Georg Marcgraf von Liebstad's *Hist. Rerum Nat. Brasiliae*, 136 (1648) and formally adopted by Antoine



Laurent de Jussieu in 1789 as the scientific name of this genus, which belongs to the family *Bignoniaceae*.

Description.—A tree, 50 ft. and more. The foliage is as finely cut as a fern, symmetrical and elegant. The leaves are alternate or almost opposite, each with 9 to

16 or more pairs of pinnae, each pinna having 14 to 24 pairs of leaflets ; leaflets oblong-rhomboid, $\frac{1}{5}$ to $\frac{1}{3}$ in. long, the end one larger. The plant bears loose, pyramidal panicles, 8 in. high, of 40 to 90 blue flowers, each 2 in. long and $\frac{3}{4}$ to 1 in. wide, which have a long, bent, swelling tube and the 2 lobes of 1 lip smaller than the 3 other lobes (or in other words : corolla 2 in. long, the tube slender and curved below, inflated above, the limb 2-lipped, one lip 2-lobed, the other 3-lobed), calyx small, 5-toothed. Anther-bearing stamens 4, 2 a little longer than the other 2 ; barren stamen (staminode) much longer than the 4 anther-bearing stamens, hairy at the tip, and liable to be mistaken for the style and stigma. Fruit an oblong, ovate or broad dehiscent capsule.

A very beautiful tree with foliage resembling that of the Albizzias or Mimosas, it ranks among the best flowering trees or shrubs for sub-tropical and tropical regions.

It is a native of North-west Argentina and of somewhat recent introduction to India, but is now becoming common in gardens.

This tree is not common round Bombay and although it does sometimes flower there, the temperature or perhaps the sea air does not appear to suit it so well as up-country. At Pachmarhi, C.P., this tree thrives and flowers splendidly, as also in Northern India.

The flowers are violet-blue in colour at first, but the colour varies according to the number of days they have been out and other conditions, some flowers being almost mauve. Flowers in March and also at other times.

Gardening.—Propagated by cuttings of half-ripened wood. It stands pruning well and can be kept in regular form.

Uses.—It makes a useful avenue tree.

The plant is used medicinally in Colombia : an infusion of the leaves is taken as a pectoral ; the powdered leaves are used as a vulnerary ; an infusion of the bark is used as a lotion to wash ulcers ; the bark and the leaves are given internally for syphilis and blennorrhagia.

Vernacular names.—Brazil : Jacaranda ; *Colombia* : Gualanolay ; *Gold Coast* : Blue Jacaranda.

29. The Mimosa-leaved Jacaranda (*Jacaranda mimosifolia*).

C. McCann

30. A spray of flowers of the Mimosa-leaved Jacaranda (*Jacaranda mimosifolia*).

31. A flowering spray of Kleinhovia (*Kleinhovia hospita*).

Kleinhovia

Kleinhovia hospita

THE KLEINHOVIA

KLEINHOVIA HOSPITA *Linnaeus*, Sp. Pl. 2nd ed. **2**, 1365 (1763) ; Hooker f., Fl. Brit. India, **1**, 364 (1874).

Linnaeus dedicated this genus to a correspondent whom he described as " Kleinhof horti Bot. cultor in Java." We are indebted to Dr C. A. Backer, formerly botanist at Buitenzorg, for the further information that Linnaeus's correspondent was Christiaan Kleynhoff, born (year unknown) at Sandau in Upper Silesia. He was a Government physician for three years in Western India and for twenty-one years in Eastern India and was from 1741 or 1742 a civil officer of V.O.I.C. (United East India Company). He had a garden at Batavia in which many native and Chinese medicinal plants were grown. He returned to Holland in 1763 and died at Culemborg, Holland, in 1777.

The Latin epithet *hospita* is the feminine of *hospes*, " a visitor, guest, friend," which by transference came to mean " he who treats another as his guest," and was also used adjectivally by the Romans in the sense of " hospitable, carrying or sheltering others " as well as " strange or foreign." Linnaeus when naming genera after persons often took care that there should be a link between the person and the plant, and he gave a number of examples, not all of them complimentary, in his *Critica Botanica* (1737). Burmann's account of Kleynhoff's generosity suggests that Linnaeus intended the epithet to apply to *both* the hospitable Kleynhoff and his tree. In so doing Linnaeus undoubtedly had in mind the description (translated below) given by Rumphius under the name " Cattimarus " or " Kinar-Boom " in his *Herbarium Amboin.* **3**, 178 (1743) :—" When these trees occur in remote places they grow tall and handsome but around the dwellings of men they are stunted and badly shaped on account of the branches being often cut back, which the tree nevertheless quickly sprouts again after the manner of a [pollarded] willow, with the result that as the shoots grow thickly together they support many parasitic [*i.e.*

epiphytic] herbs, among them species of ferns, polypodies and mosses, while snakes, lizards, ants and similar animals shelter in the upper rotting cavities." A tree fostering so many unbidden guests certainly merits the epithet *hospita*.

This is a moderately sized tree with large leaves and showy panicles of delicate rose-pink flowers. The leaf is oval, often with a heart-shaped base. Its veins, 3 to 7 in number, grow out fan-wise from the base. The small flowers are in large many-branched clusters. The five sepals of the flower fall off early, leaving only the pink unequal petals, the uppermost of which has a long claw-shaped apex. The stamens unite to form a slender column, which widens into a cup, bearing in each of its five divisions three 2-celled anthers. The ovary is 5-celled and lobed and lies in the cup formed by the stamens. The style is slender, the stigma divided into five parts. The fruit is a membranous inflated capsule, having seeds marked with small tubercles. It belongs to the *Sterculiaceae*.

Flowering season.—July to August; March and September in the Philippine Islands.

Distribution.—The tree is indigenous to the delta of the Mekong River. It is common on the shores of the Malay Archipelago and grows inland in tropical East Africa and Australia. It was introduced into Ceylon about 1820 and is now fairly established in cultivation in Western India.

Gardening.—A beautiful tree particularly when in bloom and really worthy of cultivation. It is propagated by layers; seeds are rarely procurable.

Uses.—Frequently grown as an avenue tree, especially in Calcutta and Poona.

The shoots and tender leaves are eaten cooked in the Philippine Islands. In Cochin China a decoction of the leaves is used as a lotion to wash cutaneous eruptions and cure scabies. The bark yields a strong bast fibre.

The old timber is said to be highly valued in Java for handles of kreeses.

Vernacular names.—*Cochin China*: Tra; *Ilocano*: Bignon, Bitang Bitnog, Bitnon, Bitnong; *Pampangan*: Pampar, Panampat; *Tagalog*: Tanag; *Tamil*: Panaitteku; *Visayan*: Hamitanago, Tanag.

Roxburgh's Kydia

Kydia calycina

ROXBURGH'S KYDIA

KYDIA CALYCINA *Roxburgh*, Pl. Coromandel, **3**, 12, t. 215 (1811), Hortus Bengal. 51 (1814), Fl. Ind. ed. alt. **3**, 188 (1832) ; Hooker f., Fl. Brit. India, **1**, 348 (1874).

The genus *Kydia* belongs to the family *Malvaceae* and is named after Colonel Robert Kyd (1746-93), founder and first director of the Indian Botanic Gardens, Calcutta. The epithet *calycina* ("belonging to a calyx," hence applied to plants distinguished by an usually prominent

or well-developed calyx) here refers to the calyx-like involucre which Roxburgh regarded as an exterior calyx.

Description.—A large shrub or small tree. Leaves 3 to 6 in. long, fanwisely 7-nerved, heart-shaped at the base, usually 3 to 7 lobed ; lobes often angular, the median one the largest, smooth above, densely close-haired beneath ; leaf-stalk 1 to 2 in. long. Panicles many-flowered, covered with tawny short hairs ; flower-stalk $\frac{3}{8}$ in. long. Below the calyx there is a series of 4 to 6 strongly nerved involucral bracts which enlarge and persist in fruit, $\frac{1}{4}$ to $\frac{3}{8}$ in. long. Corolla white or pink ; petals reversedly heart-shaped, longer than the calyx, prolonged into a claw at the base with a tuft of hairs on

either side. The filaments are united to form a staminal tube for a little more than half their length, then divide into 5 spreading branches, each carrying 3 almost stalkless anthers. Style branches 3, each surmounted by a large, disc-like stigma. Fruit 3-valved, about the size of a pea, covered with mealy dust, rounded with a slightly umbrella-shaped top. Seeds kidney-shaped, striated, brown-black.

Distribution.—Common throughout India and Burma, chiefly in mixed and deciduous forests, not arid regions.

Gardening.—Propagated from seed. The seeds possess a comparatively low germinating power but this is compensated by the large number produced. The seeds should be sown in seed beds, and the seedlings transplanted when they are 2 to 3 in. high. The rate of growth is rapid and it has been estimated that the tree reaches its maximum growth at a comparatively early age, though the exact age has not been ascertained (Troup).

The leaves commence to fall at the end of November and the plant is leafless from January or early February to late April. The flowers appear in September-October, and the masses of greenish-white or pale lilac blossoms make the tree a conspicuous sight at this season (Troup).

Economic value.—The inner bark yields a bast fibre used for coarse ropes. The young bark is used, on account of the quantity of its mucilage, to clarify sugar. It is a remarkable bark abounding in gum.

The wood is white, soft, with no heartwood ; weighs 40 to 45 lb. per cubic foot ; is used for house-building, ploughs, oars, spoons, for carving, and for charcoal and fuel.

The saplings are used, owing to their great strength and elasticity, for making banghy sticks.

Vernacular names.—Almora : Pata ; *Amraoti* : Bhoti ; *Bhil* : Bothi ; *Bijnor* : Palao, Pattra ; *Bombay* : Motipotari, Varanga, Varangada, Varung ; *Buldana* : Bhoti ; *Burma* : Bokemaiza, Dwabote, Dwalok, Myethlwa, Tabo ; *Canarese* : Belagu, Bellaka, Bende, Bendenaru, Bendi, Billulhendi, Kadubende, Kolibende, Nayibende ; *Central Provinces* : Baranga, Bargha, Bhotti ; *Garhwal* : Pillu, Pulao ; *Garo* : Boldobak ; *Gond* : Bosha, Burkapa, Buruk, Kunji ; *Gujerati* : Mhoti-hirwani, Nihotilirwani ; *Hasada* : Bitabororo ; *Hindi* : Baranga, Bargha, Choupultea, Patha, Pola, Potari, Pula, Puli, Pulipatha,

T. D. Shrinivasan

32. Roxburgh's Kydia (*Kydia calycina*). A young tree in the Indian Botanic Garden, Calcutta.

Pulu ; *Kharwar* : Derki ; *Khond* : Wala ; *Kolami* : Bitagonir, Bittia, Gonyer, Patadhamin ; *Konkani* : Varang ; *Lambadi* : Charpili ; *Lepcha* : Sedangtaglar, Ta-gla kung hlo-sa ; *Malayalam* : Velukku, Venta ; *Marathi* : Bhendi, Bhoti, Iliya, Potari, Varung ; *Matheran* : Bhoti, Potasi, Warung ; *Mechi* : Mahow, Moshungon ; *Melghat* : Bhoti ; *Nepal* : Kubinde ; *Nimar* : Safeddhaman ; *North-Western Provinces* : Puta, Puttiya ; *Oudh* : Kakahi ; *Porebunder* : Mhoti-hirwani ; *Punjab* : Pola, Pula, Pulli ; *Ramnagar* : Pula ; *Sadani* : Baranga, Bicra, Jhari ; *Santali* : Poshkaolat, Poskaolat ; *Saora* : Erukutada, Pulan ; *Shan* : Dwabok ; *Sinhalese* : Pulé ; *Tamil* : Vendai ; *Telugu* : Kondapotari, Pachabotuka, Pandiki, Peddakusiji, Peddapotari, Potari ; *Tharu* : Patar ; *Uriya* : Bankopasia, Bharimo, Khopashya.

Standardised plant name, U.S.A.—Roxburgh's Kydia.

QUEEN OF FLOWERS

LAGERSTROEMIA SPECIOSA (*L.*) *Persoon*, Synop. Pl. **2**, 72 (1807).
Syn. *Munchausia speciosa* Linnaeus, Mantissa, **2**, 243 (1771)—*Adambea glabra* Lamarck, Encycl. Méth. Bot. **1**, 39 (1783)—*Lagerstroemia Flos Reginae* Retzius, Obs. Bot. **5**, 25 (1789) ; Hooker f., Fl. Brit. India, **2**, 577 (1879)—*Lagerstroemia Reginae* Roxburgh, Pl. Coromandel, **1**, 46, t. 65 (1796).

This genus commemorates Magnus Lagerstroem (1691-1759), a Swedish merchant who received specimens from the East and passed them on to Linnaeus. *Spĕcĭōsa* means "good-looking, showy, splendid," *flos reginae*, "flower of a queen."

This tree does not grow to a large size in Bombay, about 20 ft. in height only, probably because Bombay

is too far north for it to excel in growth, but it is a beautiful sight when in flower from May to July. There are various shades of colour in the flowers of these trees, some being purple and others different shades of mauve, approaching to pink, and these light pinkish-mauve varieties are perhaps the most beautiful. The upstanding panicles of the flowers rather remind one in shape of the white

racemes of the Horse-Chestnut (*Aesculus Hippocastanum*) Tree when in flower in England.

Description.—A moderate-sized tree but when growing on the banks of forest streams it may reach a height of 60 ft. The trunk is straight. Its pale bark flakes off in irregular patches. The branches spread widely. The leaves grow on stout stalks ; they are paler in colour below, oblong-lance-shaped and bluntly pointed at the

tips. A leaf measures 5 to 8 in. in length and $1\frac{1}{2}$ to 3 in. in width. Its main nerves—there are from 10 to 13 upward curving pairs—are conspicuous and prominent. A network of fine veins covers both surfaces of the leaf.

The tree sheds its leaves during the cold weather when some of the leaves turn coppery-red or yellow. But this leaf fall is generally gradual. Few trees are absolutely bare. The young leaves come out with the blossoms in May. Then the tree covered with great clusters of large mauve flowers is a delight to the eye. Its massed flowers have not the aggressive beauty of the Gul Mohur or the Flame of the Forest but their soft pastel colouring is tenderly attractive and pleasing. Each cluster or panicle of flowers may be quite a foot in length springing from the branch as an upstanding spike, massed with flowers

at its base and bearing numerous downy pink and green buds towards its tip. The earlier flowers at the bottom of the spike fade to a paler tone, thus varying the colours of the cluster from deep to palest mauve. The colouring of the flowers varies in different trees ; in some it is almost purple, in others mauve or pinky-mauve, while there is a beautiful variety in which the colours are bright pink. The calyx of the flower is green. It is covered with a white, sometimes reddish, down. It has 6 or 7 sepals which are fused together and form a heavily ribbed cup with a lobed brim.

There are 6 or 7 petals, very crinkled and wavy, rounded at the apex and clawed or narrowing suddenly at the base. The stamens are all equal, shorter than the style ; they are purplish-red and bear yellow anthers. The tree fruits in great profusion and the fruits persist for a long time. Green fruits of the current season are seen on the tree together with blackened fruits of the preceding season. They are globular in shape and contain smooth pale brown seeds.

Flowering season.—Flowers during the hot season and fruits during the rainy season. But young trees may be found in flower late in the rains.

Distribution.—W. Ghats of North Kanara and South Konkan through Malabar to Travancore, along the banks of nalas and rivers and in swampy localities, North Circars, Chota Nagpur, East Bengal, Assam, Burma, Malaya, China, Ceylon. Very often cultivated, especially so in the Gorakhpur district of the United Provinces.

Leaf-shedding, flowering and fruiting.—The tree sheds its leaves about February to March, the leaves turning reddish before falling ; the new leaves appear in April to May. The large terminal panicles of mauve flowers, 2 to 3 in. in diameter, appear from April to June, at which time the trees are extremely handsome. The capsules 5-6-valved, broadly ovoid, $\frac{7}{10}$ to 1 in. long, ripen from November to January, according to locality, though they do not actually open and scatter the seeds for some little time. The seeds are light brown, angular, fairly hard, with a stiff, brittle wing, the whole $\frac{3}{5}$ to $\frac{7}{10}$ in. long ;

C. McCann

33. Flowers of the Queen's Flower Tree (*Lagerstroemia speciosa*).

they are often unfertile. The tree seeds at an early age ; vigorous plants raised from irrigated broadcast sowings at Dehra Dun commenced to bear seed at the age of three years.

Gardening.—" In full blossom in the morning the tree looks as if mantled with roses, but the flowers change through the day to a beautiful purple, making it appear at evening, if seen from a short distance, like a bower of English lilacs " (Hunter).

During the first season the growth of the seedling is slow, a height of only 2 to 6 in. being ordinarily attained by the end of the year ; subsequently the growth is considerably faster. Weeding and irrigation, particularly the former, greatly stimulate growth. Owing to the lightness of the seed and the small size of the young seedlings, direct sowings are less suitable than transplanting from the nursery.

Economic value.—The tree exudes a resin. The wood is of a light walnut colour, reddish or nearly white, tough and valuable under water, but not underground ; used in India for boats, canoes, gun carriages, carts, wagons, ammunition box-boards, building, etc. ; in Ceylon for casks and various other purposes ; in Burma, where it is one of the most important timber trees, for somewhat similar purposes ; recommended for paving blocks ; weight per cubic foot, 41·77 lb.

In addition to its value for timber, the tree is everywhere admired for its beauty, and the main efforts seem to be centred in growing it under cultivation for ornamental purposes. This is the most valuable timber of Sylhet, Cachar and Chittagong and in Burma the next in value after teak.

Medicinal properties and uses.—The root is prescribed as an astringent. The root, bark, leaves and flowers are used in native Indian medicine. It is stated that the seeds are narcotic, the bark and leaves purgative. The fruit is used in the Andamans as a local application for aphthae of the mouth.

Vernacular names.—Assam : Ajhar, Jarul ; *Bengal* : Jarul ; *Bombay* : Bondara Taman ; *Burma* : Eikmwe, Pyengma, Pyinma, Konepyinma ;

Canarese : Challa Holedachalla, Holematti, Maruvachalla, Nirbendeka ; *English* : Queen's Flower, Queen of Flowers ; *Garo* : Bolashari ; *Hindi* : Arjuna, Jarul ; *Ho* : Garasekre ; *Kadir* : Semmaruta ; *Kolami* : Garasaikre ; *Konkani* : Tamonn ; *Magahi* : Kamaung ; *Malayalam* : Atampu, Chemmaruta, Katalpu, Manimarutu, Nirmarutu, Nirventekku, Puvalventekku ; *Marathi* : Bondara, Motabondara, Taman, Tamana ; *Mundari* : Garasekere, Kuiri ; *Philippines* : Banaba ; *Sanskrit* : Arjuna ; *Santali* : Sekra ; *Sinhalese* : Murutagass, Murute ; *Tamil* : Kadali, Kadalimugai, Kadalippuva, Pumarudu ; *Telugu* : Varagogu ; *Tulu* : Challa ; *Uriya* : Ary, Jarulo, Patoli.

Standardised plant name, U.S.A.—Queen Crapemyrtle.

Queen of Flowers

Lagerstroemia speciosa

THE CRÊPE MYRTLE

LAGERSTROEMIA INDICA *Linnaeus*, Syst. Nat. 10th ed., 1076 (1759) ; Hooker f., Fl. Brit. India, **2**, 575 (1879).

Another species of the same genus is widely grown in Indian gardens : the Crêpe Myrtle (*Lagerstroemia indica* Linn.), called Chinai-Mendhi. It is a native of China. It is one of the most beautiful shrubs in our gardens and grows to a height of 7 to 8 ft. The flowers hang in bunches at the extremity of the branches. The flowers are usually bright pink, but there are dark crimson, bluish, purplish and white forms. It flowers at the beginning of the rainy season. Easily propagated by cuttings or seeds.

It is widely spread throughout the tropics and the warmer temperate regions of the globe.

The bark is considered stimulant and febrifuge.

In Indo-China the bark, leaves and flowers are said to be purgative, hydragogue, drastic.

Vernacular names.—Bengal : Phurush, Telingachina ; *Bombay* : Chinaimendhy, Dhayti ; *English* : Crape Myrtle, Crêpe Myrtle, Crêpe Plant, China Privet, Indian Lilac ; *Guam* : Melindres ; *Hindi* : Chinaimendhi, Farash, Phurush, Saoni, Telingachina ; *Indo-China* : Tuong vi bang lang se, Tu vi bach nhat hong ; *Manila* : Melindres ; *Mexico* : Astronomica ; *Tamil* : Pavalakkurinji, Sinappu, Tindiyam ; *Telugu* : Chinagoranta.

Standardised plant name, U.S.A.—Common Crapemyrtle.

THE INDIAN CORK TREE

MILLINGTONIA HORTENSIS *Linnaeus filius*, Suppl. Pl. 291 (1781); Hooker f., Fl. Brit. India, 4, 377 (1884).
Syn. *Bignonia suberosa* Roxburgh, Pl. Coromandel, 3, 11, t. 214 (1811), Fl. Ind. ed. alt., 3, 111 (1832).

Sir Thomas Millington (1628-1704), English physician and professor at Oxford, to whom Linnaeus's son dedicated this genus, was credited by Grew in 1676 with the suggestion that in the flower "the Attire [presumably the stamens] doth serve as the Male for the Generation of the Seed" and hence has been regarded as a discoverer of sex in plants. The credit for proving experimentally the fertilising effect of pollen on the pistil belongs to a German professor, Rudolf Jacob Camerarius (1665-1721). *Hortensis* means "pertaining to gardens."

Description.—An elegant, straight tree reaching as much as 80 ft. in height, with drooping branchlets and a graceful elongate crown of deep green foliage. Its yellowish-grey bark is cracked and furrowed in various directions with corky fissures.

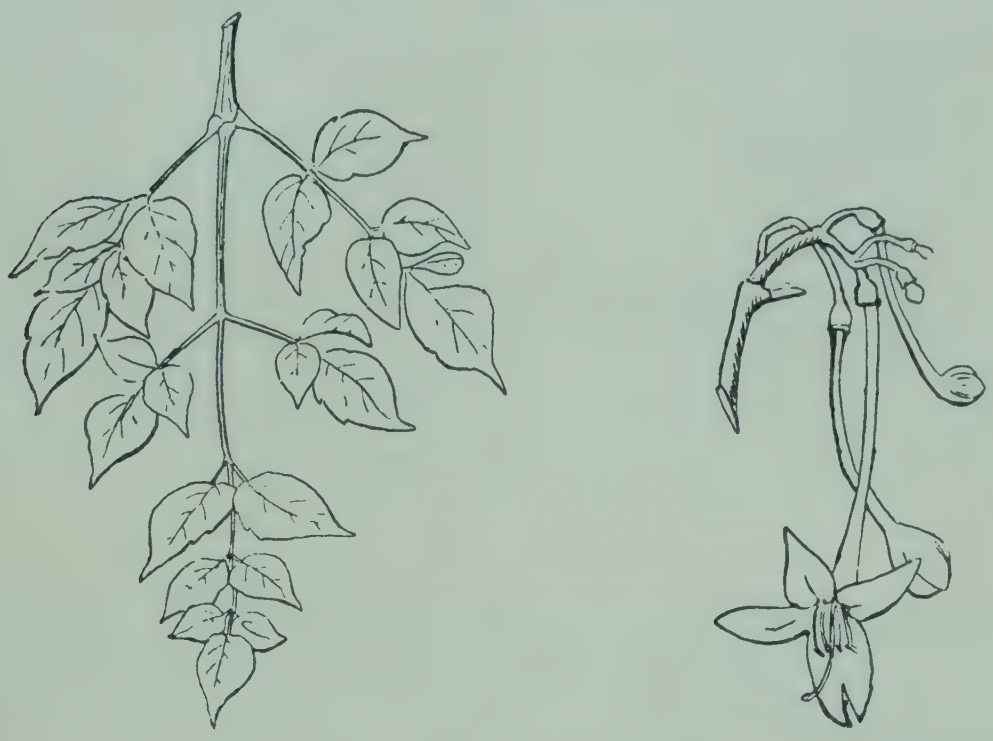
The foliage is very handsome. The leaves attain a length of 18 to 20 in. They are described as bi-pinnate or tri-pinnate, that is, each leaf is composed of two to three pairs of pinnae or minor leaves arranged in pairs along the main rib. The pinnae bear smooth, oval or lance-shaped leaflets, 2 to 3 in. long. The young shoots are slightly hairy below. Though never completely bare, the Cork Tree sheds a good proportion of its leaves between January and March and renews its foliage between April and May.

In Bombay and the Konkan, flowering commences about the end of October and continues right into December; in other parts of Western India trees flower in August and September. Decked in drooping masses of snowy white flowers which stand out against the dark foliage, the tree presents a beautiful appearance. Like many of the members of its charming family, the *Bignoniaceae* (Trumpet Flowers), the flowers have a

Indian Cork Tree

Millingtonia hortensis

delightful fragrance which fills the surrounding air. The flowers grow in large panicles at the end of the branchlets. The tiny bell-shaped calyx bears the pendant, slender tube-like corolla. This tubular portion is 2 to 3 in. long and of a faint green tinge ; it expands into waxy white petals. These are sometimes flushed with pink. The petals are oval, pointed at the apex, and the largest of them is deeply cleft. There are four stamens crowned with



yellow anthers. The style protrudes well beyond the petals. The fruit is slender, compressed and pointed at both ends. It grows to a foot and a half in length.

The seeds are flat. They measure an inch across. Each seed is surrounded by a tender wing which is narrowed at the top and absent at the base. The tree does not produce fruit in Western India or in the Central Provinces.

Distribution.—The Indian Cork Tree is believed to be indigenous in the tropical forests of Burma from Ava to Tenasserim and the Malay Archipelago. It is cultivated largely in many parts of India and runs wild in certain areas of Central India as in the valley of the Godavari river. Roxburgh mentions that, about 1800, seeds of this tree were brought to Madras from the gardens of the Raja of Tanjore, from which a plant was also procured

for the East India Company's Botanic Garden at Calcutta.

Gardening.—It is a fairly common roadside tree in Western India. Though ornamental, it is not very suitable for avenues, as it is tall rather than spreading. The tree is fast growing. The specimen in the Botanic Gardens at Calcutta, to which we refer, reached a height of 50 ft. in twelve years.

" The tree is decidedly hardy, and is not particular as to soil ; although it grows best in a moist climate, it does fairly well in dry situations. It is, however, brittle and shallow-rooted, and is liable to be broken or uprooted by strong winds. It has a tendency to send up root-suckers in great profusion, which is a disadvantage in gardens. It is easily raised from seed when obtainable, from cuttings put down in the spring or from root-suckers put down and transplanted during the rainy season. Seed should be sown in the nursery as soon as it ripens, towards the end of the hot season, and the seedlings, which bear transplanting well, should be planted out a year later at the beginning of the rainy season " (Troup).

Uses.—The wood is soft and yellowish. It is close-grained and takes a fine polish and is used for furniture and ornamental work ; weight 42 lb. per cubic foot. From the bark, which is about an inch thick, an inferior kind of cork is made.

Vernacular names.—Bombay : Akasnim, Nimichambeli ; *Burma* : Aykayet, Egayit ; *Canarese* : Beratu ; *English* : Indian Cork Tree, Tree Jasmine ; *Hindi* : Akasnim, Minichambeli ; *Malayalam* : Katesam ; *Marathi* : Cowlanim, Nimichambel ; *Sanskrit* : Akasha-nimbu ; *Tamil* : Karkku, Kattumalli, Kirimalligai, Kudasam, Malaimalligai, Maramalligai, Sakkaram, Vachagam ; *Telugu* : Akashamalle, Karaku, Kavuki, Manumalle ; *Uriya* : Machmach, Modhumodhu, Simaromonophulo.

Bignoniaceae

The family takes its name from the Abbé Jean Paul Bignon (1662-1743), Librarian to Louis XIV of France. It is remarkable for the beauty of its flowers and principally inhabits the tropics, especially of America.

It is represented in our gardens by *Millingtonia*, *Spathodea*, *Jacaranda*, *Tecomella* and others.

34. The Indian Cork Tree (*Millingtonia hortensis*) on a roadside in Bombay.

C. McCann

35. Flowers of the Indian Cork Tree (*Millingtonia hortensis*).

THE COPPER-POD

PELTOPHORUM ROXBURGHII (*G. Don*) *Degener*, Fl. Hawaiiensis, fam. 169 b (1938).

Syn. *Caesalpinia inermis* Roxburgh, Hortus Bengal. 90 (1814), name only ; Fl. Ind. ed. alt. **2**, 367 (1832)—*Poinciana Roxburghii* G. Don, Gen. Syst. **2**, 433 (1832)—*Caesalpinia ferruginea* Decaisne in Nouv. Ann. Mus. Hist. Nat. Paris, **3**, 462 (1834)—*Peltophorum ferrugineum* (Decne) Bentham, Fl. Austral. **2**, 279 (1864) ; Hooker f., Fl. Brit. India, **2**, 257 (1878)—*Peltophorum inerme* Naves in Blanco, Fl. Filipinas, 3rd ed. t. 335 (1875-83)—*Peltophorum inerme* (Roxb.) Merrill in Philipp. Journal Sci. Bot. **5**, 57 (1910).

The generic name *Peltophorum* means " shield-bearing " (from Greek πελτη [pĕltē] " a small light shield ") and refers to the peltate stigma. The specific epithet *Roxburghii* commemorates William Roxburgh (1751-1815), a Scots doctor in the employ of the Hon. East India Company, from 1793 to 1814 superintendent of the Calcutta Botanic Garden. Unfortunately his *Flora Indica* was not published during his lifetime.

Description.—A large, handsome tree growing from 40 to 80 ft. in height. It has a smooth grey bark and a spreading crown of many branches. The feathery mimosa-like leaves add to its handsome appearance. The leaves are twice abruptly pinnate. They consist of a main axis or rhachis from 6 in. to a foot in length along which are arranged some 6 to 20 pairs of pinnae, each bearing about 20 to 30 close-set stalkless leaflets. Deep green in colour, the leaflets are oblong in shape, notched at the apex and unequal-sided. They are smooth above, almost leathery in texture and covered with slight down on the under surface. In December there is a sprinkling of yellow leaves among the foliage of many of the trees in Bombay. Leaf fall then commences and continues through January and, though never completely denuded, by the end of the month the trees look ragged and untidy. The young leaves come out in early February. The trees are mantled in the tenderest green. In a week or two the colour changes

to deep green. About mid-February rust-red upright shoots covered with downy hair spring up at the tips of the branches. They grow rapidly and some become quite conspicuous. They develop into many branched sprays bearing a profusion of bright yellow flowers. Crowned in their abundance of blooms the trees are a wonderful sight. The ground below them is carpeted

with fallen blossoms. The flower is cupped in a coppery-red downy calyx. Its wavy yellow petals are inversely oval in shape, hairy at the base and much crinkled about the margins. Its ten free stamens are clothed with dense tufts of hairs at the base and crowned with golden-yellow anthers. The style is long and thread-like. The copper-red pods cover the tree in profusion. They are particularly conspicuous during leaf fall. The pods are oblong, flat, very thin and hard, narrowed at both ends and closely veined. They grow from 2 to 4 in. in length by about an inch in breadth. The seeds are brown.

Flowering season.—In Bombay the flowering season commences in March, reaches its height in April and

COPPER-POD

Peltophorum Roxburghii

continues through May. Some trees come into flower later and are in full bloom during June. Alongside trees in full flower there are others in ripe fruit. There is a second blooming in September which is carried through October and November. Individual trees will be found in flower late in December.

Distribution.—The tree is a native of Ceylon, the Andamans, the Malay Peninsula and Archipelago and North Australia.

Gardening.—Much cultivated for ornament. A large number of these trees have been planted alternately with Gul Mohur (*Delonix regia*) trees on Hughes Road in Bombay. In April and May they make a wonderful blaze of colour, their bright yellow crowns contrasting with the scarlet heads of the Gul Mohurs. The tree is easily propagated from seed, the seed pods being freely produced.

Uses.—The timber is much in request for cabinet work (Hill). It is blackish, the sapwood white, coarse, fibrous, light (Kurz, *Forest Flora of Burma*).

Vernacular names.—English : Rusty Shield-bearer ; *Tamil* : Ivalvagai, Perungondrai ; *Telugu* : Kondachinta.

Standardised plant name, U.S.A.—Sogabark Peltophorum.

THE PAGODA TREE

PLUMERIA RUBRA *Linnaeus* forma ACUTIFOLIA (*Poiret*) *Woodson* in Ann. Missouri Bot. Gdn. **25**, 211 (1938).

Syn. *Plumeria acutifolia* Poiret in Lamarck, Encycl. Méth. Bot. Suppl. **2**, 667 (1812) ; Hooker f., Fl. Brit. India, **3**, 641 (1882).

The generic name *Plumeria* is after the Franciscan traveller and distinguished French botanist, Charles Plumier (1664-1706) ; *acutifolia* describes the pointed or tapering leaves. The genus *Plumeria* is included in the family *Apocynaceae*, the Dogbanes.

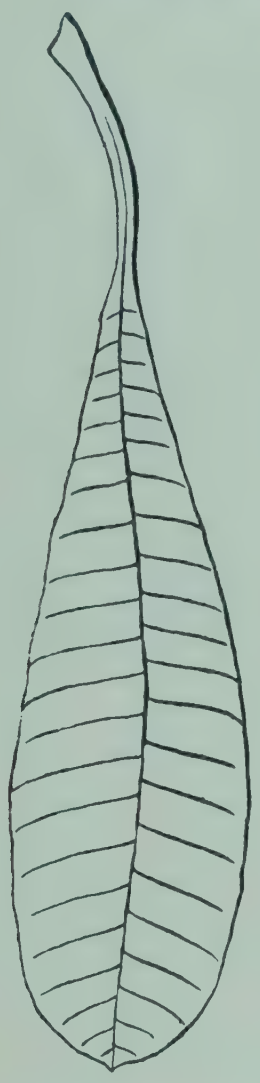
Mr C. E. C. Fischer, late of the Royal Botanic Gardens, Kew, writes as follows in reference to the name :—

" The correct name of the genus is *Plumeria*. It is made in honour of a Frenchman named Plumier, it is true, but Tournefort latinized his name to *Plumerius*. He wrote '*Plumeria*, ab inventore Clariss. Plumerio.' Linnaeus took up the name as *Plumeria* and that spelling must be retained."

This is the tree so frequently cultivated in the neighbourhood of temples, where it supplies the continuous demand for flowers used as votive offerings to the gods. Its remarkable power of bursting into leaf and blooming even when taken out of the soil has led it to be regarded as an emblem of immortality. As such its frequent presence in graveyards is not altogether inappropriate. The author of *The Cruise of the Marchesa* refers to the Dead Man's Flower dropping its deliciously fragrant blossoms over the quaint tombs of the Sulu islanders. Writing of this tree he says, " Buddhist and Mahommedan alike plant the Champac above their dead. So should we, I think, did our climate permit it. Day after day throughout the year, the tree blooms. Day after day the delicately creamy corollas fall upon the graves, retaining both their freshness and their fragrance unlike any other flower."

Description.—The Pagoda Tree grows from 15 to 20 ft. in height. Its grey-coloured bark is rough and scaly.

On injury the inner bark and every part of the tree exude a copious flow of a white and viscid juice, hence its Sanskrit name, *Kishira-champa*, meaning "Milky Champa." The leaves grow in crowded spirals at the tips of the branches. The leaf is slightly over a foot in



length. It is smooth, broadly lance-shaped and tapers at both ends. Very distinctive are the straight, parallel veins which run from the mid-rib to the margin of the leaf, where they are absorbed in a waved vein which runs along its borders. The Pagoda Tree sheds its leaves during November and December and does not renew them till the commencement of the rains. Young trees remain in leaf through the year. In full leaf the tree is not without elegance but, stripped of its handsome foliage, its crooked trunk and the grotesque outlines of its blunt and swollen branches give it an uncouth and gouty appearance. The

flowers grow in upright clusters at the tips of the branches. In well-cultivated trees the clusters are large and contain quite as many as twenty blooms. The large, waxy white flower has a distinctive golden centre. It is funnel-shaped with five spreading petals, faintly tinged with pink below. The left margin of each petal has a tendency to curl over. The stamens are inserted deep within the tube of the flower. They are not visible externally. These are

perhaps amongst the most fragrant of tropical flowers. They distil, particularly at night, a perfume which is almost overpowering.

Flowering season.—February to October ; practically throughout the year.

The fruit is a pod about 5 in. long. The Pagoda Tree rarely seeds in this country.

Variety.—There is a handsome variety of *P. rubra* in which the buds are a deep, glossy crimson. When fully open half the underside of each petal is a dull crimson, the other half creamy white. The curling edge of the petal displays a beautiful, crimson margin and the throat of the flower is more vividly golden than in the commoner variety. This is *P. rosea* f. *tricolor.*

Distribution.—A native of Mexico and Guatemala, the Pagoda Tree is believed by some writers, though wrongly,

Frangipani

Plumeria rubra rubra (left)

Pagoda Tree

Plumeria rubra acutifolia (right)

to be indigenous to China and Cambodia. Rumphius, who first described the tree under the name *Flos convolutus*, says it was brought to Amboyna by Chinese merchants from Cambodia. Its Hindustani name, *Gul-e-chin*, meaning "Flower of China," and the Burmese name, *China-champac*, suggest that it likewise reached India *via* China. In 1770 it was introduced into England as a hot-house plant from the East Indies.

Gardening.—The tree is propagated by cuttings which should be allowed to wilt before planting. At first they should not be kept too moist. The hot season is the best time for planting. During the cold weather large specimens may be transplanted without the accompanying soil.

Uses.—Attempts to manufacture caoutchouc from the viscid juice of this tree have been without success. The sap is employed with sandalwood oil and camphor to cure itch, and is used as a counter-irritant to cure rheumatic pains.

The bark, known as *A'chin*, is recommended by the Persians as a cure for gonorrhœa and venereal sores. It is used for a similar purpose in Porto Rico. In Bombay it is used for intermittent fevers as we use Cinchona. In the Konkan, it is given with coconut, ghee and rice as a remedy for diarrhœa. A decoction from the bark makes a powerful anti-herpetic. Its use as a purgative is not without danger. Several cases of death from excessive purging after its use have been recorded. Plasters made from the bark are said to be useful in dispersing hard tumours.

The leaves, after being heated, are applied as a poultice to reduce swellings. In Goa the leaves and branches are tied round coconut palms to protect them against the attacks of the Long-horned Beetle (*Batocera rubra*).

The flower buds are taken with betel leaves as a febrifuge. The seeds, when available, are boiled in milk and given as an antidote in cases of snake-bite. Mr Millard once had a few seed-pods on one of the trees in his garden in Bombay and his Mahratta *malis* expressed the belief that the seeds were eaten by cobras. The seeds certainly

disappeared but he had his suspicion that the *malis* were in league with the cobras.

Both the bark and the fruit are useless in the antidotal and symptomatic treatment of snake bite ; the fruit is also useless as an external application to the part bitten (Mhaskar and Caius).

Popular beliefs.—It is generally admitted that the seed of the Pagoda Tree is the antidote *par excellence* in cases of cobra bite. And the proof thereof is that the tree rarely seeds—and that because cobras intentionally destroy the pods !

Vernacular names.—Assam : Goalanchi ; *Bengal* : Dalanaphula, Goburchampa, Gorurchampa ; *Bombay* : Chameli, Champa, Dolochapa, Gutachin, Khadchampo, Khairchampa, Sonchampa ; *Burma* : Chinachampac, Taroksaga, Tayopsagah ; *Cambodia* : Champei ; *Canarese* : Belchampaka, Champaka, Devaganagalu, Devaganagile, Ganagala, Gosampige, Kadusampage, Kanagile, Mogaganagile ; *Central Provinces* : Champa ; *Ceylon* : Alariya ; *Dehra Dun* : Gulachin, Gulchin ; *English* : Dead Man's Flower, Frangipani, Graveyard Flower, Jasmine Tree, Pagoda Tree, Spanish Jasmine, Temple Flower, Temple Tree ; *French* : Bois de lait, Frangipanier ; *Gold Coast* : Frangipani, Temple Flower ; *Gond* : Champapungar ; *Gujerati* : Dolochampo, Rhadachampo ; *Hindi* : Chameli, Goburchamp, Golainchi, Gulachin, Gulainchi ; *Indo-China* : Bong su do, Bong su ma, Champey sar, Daid hoa su trang, Kok don, Mien chi tu, Ti ampa ; *Konkani* : Portugalo champo ; *Malayalam* : Arali, Vellachampakam, Velattalari ; *Marathi* : Khairchampa, Rhuruchapha, Sonchampa ; *Mundari* : Golanchi ; *Naguri* : Golainciba, Golaincidaru ; *Persian* : Gulacin ; *Sanskrit* : Devaganagalu, Gosampige, Kishirachampa ; *Santali* : Champapungar, Gulanjbaha ; *Sinhalese* : Alariya ; *Tagalog* : Calachuchi, Calasusi, Calatsutsi, Carachucha ; *Tamil* : Ilattalari, Kallimandarai, Kuppiyalari, Navillavalari, Perungalli ; *Telugu* : Arhataganneru, Nuruvarahalu, Vadaganneru, Veyyivarahalu ; *Tulu* : Gosampige, Sampai ; *Uraon* : Gulaici ; *Urdu* : Achin ; *Uriya* : Golochi, Kutokompa, Torato ; *Visayan* : Calatucha.

Standardised plant name, U.S.A.—Mexican Frangipani.

A. Plumeria Tourn.

Tropical trees noted for their showy and very fragrant flowers. Vying in this respect with the jessamine, Cape jasmine, and tuberose, the Plumerias are extensively cultivated in all tropical lands. The species are much

confused and imperfectly understood. Woodson in his revision of the genus (*Ann. Missouri Bot. Gdn.*, 25, 189-224, 1938), reduces to 7 species the 66 proposed by other authors !

THE FRANGIPANI

PLUMERIA RUBRA *Linnaeus*, Sp. Pl. 1, 209 (1753) forma RUBRA.
Syn. *Plumeria rubra* f. *typica* Woodson in Ann. Missouri Bot. Gdn. 25, 211 (1938).

On our coloured plate the artist has included a flowering branch of the Frangipani, the name of which is supposed to have come from that of an Italian nobleman of the Frangipani family who, in the Middle Ages, compounded a perfume of many ingredients which had an odour similar to these flowers.

Description.—Smaller than the Pagoda Tree, the Frangipani grows to a height of 12 to 20 ft. With its beautiful red flowers and handsome foliage it is especially ornamental. The leaves are smaller than those of the Pagoda Tree, being 5 to 8 in. long. The flowers grow in crowded clusters on downy, red stalks. The petals are red, centred with rich yellow. They are broadly oval in shape and rounded at the apex. The flowers have a pleasant scent which is not so overpowering as in the Pagoda Tree. In South America, women adorn themselves with these flowers and put them among linen to scent it as we do lavender.

Distribution.—The native home of the Frangipani extends from Mexico to Guiana and Ecuador.

Economic value.—The extract, more especially that from the young branches, has been found to contain a fair proportion of caoutchouc ; an analysis showed 25·5 per cent., with 21·9 per cent. resinous matter and 15·7 per cent. water.

The plant is easily raised from cuttings (strong ends of the branches a foot or more long) and thrives in sandy or stony soil with a rainfall of about 25 in. and upwards ; it grows quickly and is very desirable for decorative purposes, though the stems have a somewhat bare appearance if not kept lopped regularly.

Vernacular names.—English : Jasmine Tree, Red Jasmine of Jamaica, True Frangipani ; *French Guiana* : Frangipanier rose ; *Gold Coast* : Red Frangipani ; *La Réunion* : Frangipanier rouge ; *Loanda* : Jasmin mangueira ; *Marathi* : Lalchampa.

Standardised plant name, U.S.A.—Nosegay Frangipani.

THE WHITE FRANGIPANI

PLUMERIA ALBA Linnaeus, Sp. Pl. 1, 210 (1753).

Another species of *Plumeria* which is not so common is the White Frangipani, *P. alba.* It is a native of the West Indies, i.e. of Puerto Rico and many of the Lesser Antilles. The tree is about 15 ft. in height. Its rigid brittle leaves are rounded at the apex. They are smooth above, hairy beneath and curl inwards at the margins. As with *P. rubra*, the tree remains in leaf through the cold and hot weather. The flowers are white without the yellow throat.

Vernacular names.—English : White Chumpa, White Frangipani ; *French* : Bois de lait, Frangipanier, Laurier bâtard ; *French Guiana* : Bois de lait, Frangipanier blanc ; *La Réunion* : Frangipanier blanc ; *Sanskrit* : Kananakaravira ; *Tamil* : Peru, Perumallari, Perungalli ; *Telugu* : Veyyivarahalu.

Standardised plant name, U.S.A.—White Frangipani.

B. APOCYNACEAE

The members of the family *Apocynaceae* (from Greek ἀπόκυνον [apŏkunon], "dog's bane") principally inhabit the inter-tropical zone of the Old and New Worlds, especially Asia beyond the Equator. They are comparatively rare in extra-tropical hot and temperate regions. Most of the species possess a milky juice, often rich in indiarubber ; sometimes bitter and employed as a purgative or febrifuge, or depurative ; sometimes acrid and very poisonous ; sometimes mild, scarcely bitter, and simply laxative ; finally, sometimes acid-sweet or unctuous, and much sought as food.

PADAUK

Pterocarpus indicus

THE PADAUK

PTEROCARPUS INDICUS *Willdenow*, Sp. Pl. **3** (ii), 904 (1802) ; Hooker f., Fl. Brit. India, **2**, 238 (1876).

Though commonly referred to as the Padauk in towns and stations, this is not the true Padauk of Burma, which is *Pterocarpus macrocarpus*. They belong to the family *Papilionaceae* of the order *Leguminosae*.

The generic name derived from the Greek means " winged fruit " and refers to the pods produced by the trees of the genus.

Description.—The tree grows to a height of 50 ft. It has a straight trunk with smooth olive-coloured bark and a wide crown of dark green foliage and wavy drooping branches. The branches are few and tend to form low on the comparatively short bole. The leaves, 8 to 10 in. long, grow alternately on the branches. Each leaf is composed of 8 to 10 leaflets arranged alternately on the stalk. The leaflets are 3 to 4 in. long and 2 to $2\frac{1}{2}$ in. broad. They are glossy on both sides, oval, with smooth margins and notched at the apex, their stalks smooth, slightly channelled and flexuous. About the last week in May, in Bombay, or early in the rains (June), the tree is covered with clusters of fragrant deep orange or yellow flowers. They grow in single or compound racemes from the joints of the branchlets, while single racemes form a much larger panicle at the ends of the branchlets. The flower has a short five-toothed calyx, the two upper lobes being larger than the rest. The petals comprise an erect wrinkled, claw-like banner petal flanked by two curly wing petals of the same colour and two smaller and paler and less curly keel petals. The ten stamens are united to form two equal bunches of five, capped by small two-lobed, deep yellow anthers ; the style is shorter than the stamens and the stigma acute. The pod is 1 to 2 in. in diameter. It is round and wrinkled, very tough and woody, its central part containing one, rarely two, brown, smooth and shining seeds.

Flowering and fruiting.—The flowers appear in two or three separate flushes early in the rainy season, about May to July, and the pods ripen in the cold season, about January and February (Troup).

Mr R. H. Macaulay, of Wallace Bros. & Co. (Bombay-Burma Trading Corporation), writes as follows: "The peculiarity of the tree is that all the Padauk trees burst into flower on the same day. If I saw a Padauk in flower in the bungalow compound, I was sure to see Padauks in flower all the way down to my office in Rangoon. I think the flower did not last long and fairly soon the trees flowered again. The Burmans used to say that the rains would not come until the Padauk had flowered three times."

The flowers are so short-lived that it has been with much difficulty that we have been able to obtain a coloured sketch of this tree.

Distribution and habitat.—Common as a roadside tree all over the Malay Peninsula, is believed to be indigenous in the Malay Peninsula and Archipelago, whence it has been introduced into Burma, where it has been largely planted in gardens and along roadsides and avenues in the damper parts of the country. It has also been planted to a small extent about Calcutta and Madras. More recently it has been introduced into Bombay, where it promises to do well (Troup).

This tree was first introduced into Bombay by Mr Justice (afterwards Sir Edmund) Fulton, I.C.S., who sent three or four young trees from Rangoon to Mr W. S. Millard about 1906. These were all planted and have flourished, the one planted in the University Gardens flowering each year towards the end of May. There is a considerable number of these trees growing in and around Bombay now.

Gardening.—The tree may be propagated from seed; loose soil and protection from sun favour the early development of the seedling, but the seedlings are very sensitive to frost and do not survive when frosts are prevalent. The tree thrives best in a tropical climate with a rainfall of not less than 60 in. It requires a deep well-drained

soil and does not thrive on stiff clay. The tree is commonly propagated by large cuttings, which should be planted in the prepared pits in rather sandy soil early in the rainy season, or, if watering can be carried out, about the month of February. Nursery-raised plants are ready for transplanting at the commencement of the second rains, when they are rather more than one year old ; planting can be most successfully carried out by transferring the seedlings to bamboo baskets during the first rains and planting them out in the baskets during the second rains (Troup).

Uses.—In Burma the tree is often cultivated for its sweet-scented flowers and as an ornament. As it is in full foliage during the hot weather it is largely planted for shade.

The wood is used for furniture, and is excellent for carts and gun-carriages.

The tree produces a gum which, when dried, is as good as the true Indian kino derived from *P. marsupium.*

The kernel of the fruit is emetic. The wood is much used in Cambodia for its antithermic and antimalarial properties ; it is also considered diuretic and anti-dysenteric.

Vernacular names.—Andamans : Chalangada ; *Burma* : Padauk, Patouk, Toungkhayai ; *Cambodia* : Chankraham ; *Canarese* : Honne ; *English* : Andaman Redwood, Malay Padauk, Padauk ; *Malaya* : Angsana ; *Philippines* : Agana, Antagan, Asana, Daitanag, Naga, Narra ; *Tamil* : Vengai ; *Telugu* : Ettavegisa, Gandamrigapunetturu, Simagandamrigapunetturu.

Standardised plant name, U.S.A.—Burma-coast Padauk.

THE SILK-COTTON TREE

SALMALIA MALABARICA (*DC.*) *Schott and Endlicher*, Meletemata Bot. 35 (1832).

Syn. *Bombax malabaricum* De Candolle, Prodr. 1, 479 (1824) ; Hooker f., Fl. Brit. India, 1, 349 (1874)—*Gossampinus rubra* Buchanan-Hamilton in Trans. Linn. Soc. London, 15, 128 (1827)—*Gossampinus malabarica* (DC.) Merrill in Lingnan Sci. Journal, 5 (for 1927), 126 (1928).

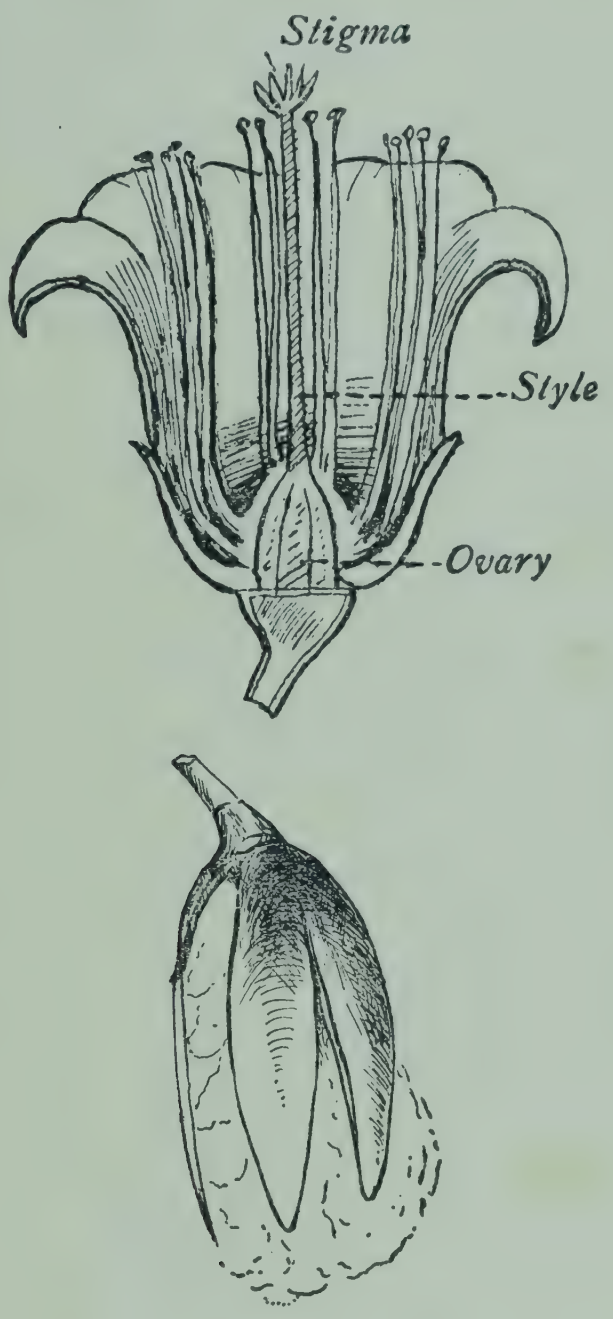
Description.—A tall deciduous tree with wide spreading branches arranged in whorls. The stem is usually undivided and is generally supported at the base with large buttresses. The colour of the bark is grey ; it is covered

with sharp, conical prickles which disappear with increasing age. The leaf is large and hairless. It is composed of from 3 to 7 long, lance-shaped, more or less leathery leaflets, arranged like the fingers of a hand, on a long common stalk. The diagram illustrates the shape and arrangement of the leaflets. The crimson flowers are large and numerous. They grow in clusters on short thick stalks towards the ends of the branches, and appear before the new leaves. Occasionally the flowers are yellowish or white.

Silk-cotton Tree

Salmalia malabarica

Calyx thick, fleshy, cup-shaped, smooth outside, bright silky hairy within. The petals are hairy on the outside, slightly hairy within. They are fleshy, bent back and



marked with close parallel veins. The petals may be from 3 to 6 in. long. The stamens, of which there are more than 60, are pink, flattened, slightly hairy, rather more than half as long as the petals. They are united only at the base to form 5 separate bundles containing from 9 to 12 stamens each. There is, in addition, an inner bundle of 15 stamens of which the 5 innermost are the

longest ; the anthers are long and brown. The accompanying drawing of a longitudinal section of the flower illustrates its general form and the arrangement of the inner organs. The ovary is conical in shape. It contains 5 cells, each holding many ovules. The ovary tapers at the apex to form a club-shaped style which exceeds the stamens in length and ends in 5 slender projections—the stigmas.

The fruit attains a length of 4 to 5 in. It is oblong-egg-shaped, downy without and lined within with white silky hairs. It contains many dark brown seeds packed in white cotton.

Leaf-shedding.—In dry localities the trees start shedding their leaves at the beginning of December and are leafless by the end of that month. In moist localities the trees may keep their leaves till March. The new leaves make their appearance in March and April.

Flowers.—The large dark brown buds become visible in the month of December and the flowers come out in January and February, and sometimes continue till March. At the time of flowering the trees are usually leafless, but when flowers and leaves appear at the same time, the flowers are usually less numerous.

" The trees when in full flower present a striking blaze of colour ; the fleshy petals are attacked by crows, mynahs, and other birds, and when they fall to the ground they are eagerly devoured by deer. I have observed squirrels (*Sciurus maximus*) eating the flower-buds in quantities. Pollination is affected by bees, which visit the flowers in large numbers, as well as by birds, which seek the nectar or search for insects, and get their heads covered with pollen. Even martens (*Martes flavigula*) have been observed visiting the flowers in search of nectar " (Troup).

Fruits.—They ripen in April and May. Usually they open whilst still on the tree, but sometimes after falling. As the seeds are packed in masses of silky hairs they are easily blown about by the wind.

Distribution.—Indigenous throughout India and Burma, except in the most arid tracts. In the sub-Himalayan

tract it extends from the Indus eastwards, ascending to 3500 ft. in the N.W. Himalaya, and is cultivated as high as 6000 ft.; very common throughout the Bombay Presidency, in the Satpuras in exposed situations on hard trap-rock at 3700 ft., in all forest districts of the Madras Presidency. Also in Ceylon, Yunnan, Cochin China, Tonkin, Siam, Java, Sumatra, Queensland and North Australia.

Economic value.—The tree yields a brown astringent, gum-like substance, known as *mocharas* and frequently seen in Indian bazaars.

The inner bark of the tree yields a good fibre suitable for cordage. Boatmen in Indo-China use the gummy fresh bark to stop holes in their craft.

The seeds yield cotton, a fibre too short and too soft to be spun.

The wood is whitish, coarse-grained, weak and brittle and subject to the attacks of white ants. A cubic foot weighs 28 lb.; it improves and is rendered more durable by moisture. In the Bombay Presidency the planks are extensively used in making the light packing boxes needed in the export of bulky goods from Bombay and other places, also for fishermen's floats; in Burma it is used for coffins, planks, doors and boxes; in the Punjab it is a favourite for well-curbs, water conduits, troughs and bridges; in Kangra and Yusufzai it is made into scabbards. The main use of the timber in Western India is for match manufacture; it is the principal timber used for this in Bombay.

Domestic uses.—The calyx of the flower is eaten as a vegetable. The leaves and twigs are lopped for fodder.

The silky floss which clothes the seeds is made into tinder, and is used for stuffing cushions and pillows.

Medicinal properties and uses.—Practically every part of the plant is used by Ayurveda practitioners; but only the gum is recognized by Yunani doctors.

Caius and Mhaskar have shown experimentally that, contrary to the accepted opinion, neither the flower nor the fruit has any antidotal value against snake or scorpion venoms.

Popular beliefs.—In the Mahabharata it is related that Pitamaha, after having created the world, reposed under the tree Salmuli.

Vernacular names.—The tree is called in Sanskrit "Yamadruma," tree of the infernal regions, because it makes a great show of flowers, but produces no fruit fit to eat.

Basim : Khatsawar ; *Bengal* : Roktosimul, Simul ; *Bhil* : Katseori ; *Bombay* : Katsevari, Saer, Saur, Semul, Shembal, Somr ; *Burma* : Didu, La-i, Lepanbin, Letpan ; *Cambodia* : Roka ; *Canarese* : Apurani, Buraga, Burga, Burla, Dudi, Elava, Hatti, Kempuburaga, Kempuburga, Mullelava, Mulluburaga, Pishphele, Sauri ; *Central Provinces* : Semar, Semur ; *Ceylon* : Parutti ; *Chinese* : Mu Mien ; *Deccan* : Kantonkakhatyan, Kantonkasemul, Lalkhatyan ; *English* : Cotton Tree, Red Cotton Tree, Red Silk-cotton Tree, Silk-cotton Tree ; *Formosa* : Moc-main, Pun-chi ; *French* : Bombax de Malabar, Cotonnier Mapou, Kapokier du Tonkin ; *Garhwal* : Shimal ; *Garo* : Bolchu, Panchu ; *Gond* : Vallaiki ; *Gujerat* : Ratoshemalo, Sauvor, Sawar, Shemalo, Shimar, Shimlo, Shimul ; *Hazara* : Simbal ; *Hindi* : Kantisembal, Pagun, Ragatsemal, Ragatsembal, Raktasemul, Semal, Semul, Semur, Shimbal, Simal, Som ; *Indo-China* : Gao, Sich moc mien thu ; *Khond* : Kamba ; *Kolami* : Del, Edel, Idel ; *Konkani* : Sanvor, Sauvor ; *Kumaon* : Shimlo ; *Lambadi* : Chamblero ; *Lepcha* : Sunglu, Tung-glu ; *Magahi* : Lapaing ; *Malaya* : Mooh min. Simur ; *Malayalam* : Ilavu, Mocha, Mullilavu, Pichila, Pula, Purani, Unnamuriku ; *Mal Paharia* : Simur ; *Marathi* : Kantasair, Kanterisamar, Kantesavar, Khatsawar, Sair, Sairi, Samar, Savara, Savari, Sayar, Semal, Shevari, Simlo, Tamari ; *Matheran* : Sarvar, Tambdisarvar ; *Melghat* : Saori ; *Mundari* : Edelsanga ; *Palkonda* : Wuraga ; *Persian* : Sombal ; *Portuguese* : Algodoeiro do matto, Arvore de panha, Panheira sumauma ; *Punjab* : Sum ; *Sanskrit* : Apurani, Kantadruma, Mocha, Shalmali, Yamadruma ; *Santali* : Edel ; *Saora* : Buroh ; *Sinhalese* : Kattuimbul ; *Sutlej* : Shirlan ; *Tagalog* : Bobuygubat, Buboygubat, Malabulac ; *Tamil* : Agigi, Ilavam, Ilavu, Kongu, Mullilavu, Parutti, Pongar, Pulai, Purani, Sallagi, Samani, Sanmali, Selavagu, Sittan, Surabu ; *Telugu* : Buraga, Kondaburaga, Mundlaburaga, Pinnaburaga, Salmali ; *Tulu* : Ala, Mullala ; *Uriya* : Buro, Mochoroso, Salmali, Simuli ; *Visayan* : Quesero, Salay, Talutu.

Standardised plant name, U.S.A.—Malabar Simal-tree.

A. Salmalia Schott and Endlicher

The genus *Salmalia* belongs to the family *Bombacaceae* (included by Bentham and Hooker in the family *Malvaceae*) and comprises the Asiatic species with a deciduous calyx, hairless receptacle and a conical or swollen stamen-tube

formerly included in *Bombax*.* The name is a latinised form of the Sanskrit name *Salmali*. There are about 10 species.

They are deciduous trees with digitate leaves. The flowers arise from the axils of the leaves and are gathered at the end of branchlets. The calyx is leathery, cup-shaped and splitting irregularly. The petals are 5. The stamens are many, inserted at the base of the calyx, united into 5 bundles opposite to the petals. The fruit is 5-celled ; the cells are thickly clothed inside with long silky hairs, in which the seeds are embedded in dense wool.

KEY

I. Stamens 60 to 70 . . . . *S. malabarica.*
II. Stamens about 400 to 600
1. Flowers scarlet or white . . *S. insignis.*
2. Flowers salmon-pink . . . *S. scopulorum.*
III. Stamens about 350 . . . . *S. anceps.*

SALMALIA INSIGNIS (*Wall.*) *Schott and Endlicher*, Meletemata Bot. 35 (1832).

Syn. *Bombax insigne* Wallich, Pl. Asiat. Rar. 1, 74, tt. 79, 80 (1830) ; Hooker f., Fl. Brit. India, 1, 349 (1874)—*Gossampinus insignis* (Wall.) Bakhuizen in Bull. Jardin Bot. Buitenzorg III, 6, 190 (1924).

A very large tree, with more or less prickly bark. Leaves hairless, long-stalked ; stalks as long or longer than the leaflets ; leaflets 5 to 9 or more, 5 to 6 in. long, inversely egg-shaped, narrowed at the base ; stalks of leaflets $\frac{1}{5}$ to $\frac{1}{3}$ in. long. The foliage of this species is difficult to distinguish from that of *S. malabarica*. Flowers

* The restriction of the name *Bombax* to an American genus makes necessary the use of another name for the Old World species. Bakhuisen van den Brink in his " Revisio Bombacacearum " (Bull. Jardin Bot. Buitenzorg, III, 6, 161-232 ; 1924) adopted *Gossampinus* Buchanan-Hamilton, which was published by Buchanan-Hamilton without any generic description in Trans. Linn. Soc. London, 15, 128 (1827) and is illegitimate. Hence the correct name is *Salmalia* validly published by Schott and Endlicher in their Meletemata Botanica (1832) ; the unusual title of this book, from the Greek μελετῆματα [mĕlĕtēmata], means " botanical exercises or examples." Reference may be made to the paper by C. X. Furtado, " The typification of *Bombax*, *Gossampinus* and *Salmalia* " in Gardens Bull., Straits Settlements, 10, 173-181 (1939).—W.T.S.

larger than in the previous species, solitary, on a thick, club-shaped, prickly stalk which is jointed at the top. Calyx 1½ in. long, irregularly splitting at the top and finally deeply 2-cleft, sometimes prickly at the base outside, densely silky-hairy within. Corolla showy, scarlet or white ; petals long, strap-shaped, 5 by 1½ in., narrowed at the base, densely tomentose on both surfaces. Stamens 400 to 600, arranged in bundles, but not so distinctly as in *S. malabarica* ; filaments filiform, 3 in. long, forked at the tip. Ovary egg-shaped, red-hairy. Style longer than the stamens ; stigma 5-lobed. Fruit a capsule, long, sausage-shaped, woody, 7 to 10 in. long, obscurely 5-angular, hairless.

Flowers much earlier than *S. malabarica.*

Distribution.—Burma (Pegu) ; Andamans ; common on the Ghats of the Western Peninsula from the Konkan southwards, gregarious in northern Kanara from the coast upwards to the crest of the Ghats, also in the Konkan and Deccan districts, Anamalai Hills.

Uses.—The wood is more durable than that of the ordinary Silk-cotton Tree and also used in match manufacture. The cubic foot weighs 31 lb. The tree yields a brown gum.

Vernacular names.—Burma : Didu ; *Malayalam* : Kallilavu, Kattupula, Paryailavu ; *Tamil* : Kattilavu, Paraiyilavu ; *Bengal* : Semultula ; *Magahi* : Saitu.

SALMALIA SCOPULORUM (*Dunn*) *Stearn.*

Syn. *Bombax scopulorum* Dunn in Gamble, Fl. Madras, 1, 100 (1915), Kew Bull. 1916, 65.

A small tree, having the appearance of the ordinary Cotton Tree but never attaining its size ; about 40 ft. high, 1 ft. diameter ; stem covered with prickles in clusters of 1 to 12, about ¾ in. long. Leaves of 6 to 8 stalkless leaflets, 5 to 9 by 1 to 2 in., lance-shaped, dark green and hairless above. Flowers salmon-pink, 4 in. across, 7 in. long, solitary, appearing before the leaves. Stamens about 600, slender, white. Style simple. Fruit 7 to 10 in. long, velvety-brown. Seeds black, smooth, ¼ in. diameter, packed in white cotton.

Flowers in December to January.

C. McCann

36. The Silk-cotton Tree (*Salmalia malabarica*) in flower.

C. McCann

37. Flowers of the Silk-cotton Tree (*Salmalia malabarica*).

38. The prickle-covered stem of the Silk-cotton Tree (*Salmalia malabarica*).

39. Flowers and fruit of the Asoka Tree (*Saraca indica*).

Fruits January to February.

Distribution.—Travancore Hill, on rocks.

Vernacular names.—Malayalam : Kallilavu, Paryailavu ; *Tamil* : Kattilavu, Paryayilavu.

SALMALIA ANCEPS (*Pierre*) *Stearn.*

Syn. *Bombax anceps* Pierre, Fl. Forest. Cochinchine, t. 175 (1888)—*Gossampinus anceps* (Pierre) Bakhuizen in Bull. Jardin Bot. Buitenzorg, III, **6**, 190 (1924).

A lofty tree, reaching a height of 100 ft. and a girth of about 16 ft. Bark greyish, more or less prickly when young. Leaflets 5 to 7. Petals red or white, 3 in. long, slightly hairy on both faces. Stamens about 350, tube formed by the stamens $\frac{1}{4}$ in. long. Style hairless. Fruit a capsule, woody, dark brown, $3\frac{1}{4}$ to 4 in. long with 5 very prominent rounded ridges.

Distribution.—Burma (Pegu and Arakan Yoma, Upper Burma, North Shan States, Salween), Cochin China.

Vernacular names.—Burma : Didok, Didu-pya ; *Karen* : Kowa ; *Pegu* : Diduletpan, Kokye.

B. BOMBACACEAE

They are all arborescent, and principally tropical ; and they include some of the largest trees in the vegetable kingdom. One of the most striking is the African Baobab, *Adamsonia digitata* Linn., grown in many parts of India ; it is remarkable for the excessive thickness of its trunk as compared with its height. The family takes its name from the genus *Bombax*, the name of which is derived from the Greek *βόμβυξ* [bŏmbux] " silkworm," hence " a silken garment," referring to the silky hairs of the fruit.

THE ASOKA TREE

SARACA INDICA *Linnaeus*, Mantissa, **1**, 98 (1767); Hooker f., Fl. Brit. India, **2**, 271 (1878).

The origin of the name *Saraca* is obscure, but is apparently derived from an Asiatic vernacular name, possibly a corruption of the name Asoka commonly applied to this tree in India.

Description.—A small evergreen tree with an erect trunk covered with smooth dark brown or greyish-brown bark. Its branches, spreading in every direction, form an elegant close-leaved crown. The leaves grow alternately on the branches. The leaf is about a foot in length. The mid-rib is smooth and round and carries 4 to 6 pairs of

Asoka Tree

Saraca indica

leaflets without a terminal leaflet at the apex. The leaflets are smooth and glossy, firm in texture with slightly waved margins. The tree is interesting as furnishing an example of drooping young leaves without chlorophyll, like those of certain other evergreen trees, for example, *Amherstia nobilis*, *Mesua ferrea*, *Mangifera indica*, *Polyalthia* and others. The young leaves are red in colour, thin and flaccid, and hang vertically downwards for some time after attaining full size. The flowers appear in large compact clusters which spring direct from the heavy

branches or from the slender terminal twigs. On opening, the flowers are a bright orange and later turn red, giving each cluster a richly variegated tone. In full bloom the Asoka is beautiful, its orange and scarlet clusters of flowers contrasting richly with the dark branches and deep green foliage. The flower has a small red leafy bract at the base of the stalk, while at the tip of the stalk are 2 small heart-shaped leaves (bracteoles) forming a false calyx. The true calyx is situated at the top of the long tapering receptacular tube (hypenthium) and has 4 oval sepals, which look like petals. A fleshy annular ring on the summit of the tube bears 4 to 7 spreading thread-like stamens, crowned with small kidney-shaped anthers. The style is nearly as long as the stamens. The pod, fleshy red when unripe, is 6 to 10 in. long. It is scimitar-shaped and contains 4 to 8 smooth grey seeds the size

of a chestnut. This leguminous pod proclaims its kinship to *Tamarindus* and other members of the family *Caesalpiniaceae*, among which *Hardwickia* also lacks petals, while *Intsia* has only one petal instead of the usual five petals.

Flowers.—January to April or May.

Distribution.—Found wild along streams or in the shade of the evergreen forests in the Khasia Hills, Chittagong, Arakan, Tenasserim, Upper Burma, the northern Circars, and the west coast of Bombay, Ceylon, Malaya.

Economic value.—The wood is light reddish-brown, soft ; heartwood hard and dark-coloured ; weight 50 lb. per cubic foot. In the northern parts of Ceylon the timber is used for common house-building purposes.

Medicinal properties and uses.—The bark is much used by native physicians in uterine affections, and especially in menorrhagia. A decoction of the bark in milk is generally prescribed. A *ghrita* called *asoka ghrita* is also prepared with a decoction of the bark and clarified butter together with a number of aromatic herbs in the form of a paste. In Orissa the bark is said to be used as an astringent in cases of internal hæmorrhoids.

The flowers, pounded and mixed with water, are used in hæmorrhagic dysentery.

Popular beliefs.—The Asoka is one of the sacred trees of the Hindus which they are ordered in the Urapaj to worship on the 13th day of the month Chaitra, *i.e.* 27th December. Its flowers, probably on account of their beauty and the delicacy of their perfume, which in the months of April and May is exhaled throughout the night, are much used in temple decoration. "The tree is the Symbol of Love, and is dedicated to Kama, the Indian God of Love. Like the *Agnus castus* it is believed to have a certain charm in preserving chastity ; thus Sita, the wife of Rama, when abducted by Ravana, escapes from the caresses of the demon and finds refuge in a grove of Asokas. In the legend of Buddha, when Maya is conscious of having conceived the Buddisattva, she retires to a wood of Asoka trees and then sends for her husband." The word Asoka signifies "that which is deprived of grief" (Folkard, *Plant-lore and Legends*).

Mason (*Burma and its People*) says the tree is held sacred among the Burmans because under it Gautama Buddha was born and immediately after his birth delivered his first address.

According to Sanskrit poetry, its nature is so sensitive that it bursts into blossom and blushes crimson if touched by the hand of a lovely woman.

Vernacular names.—Bengal: Asok, Asoka ; *Bombay*: Ashok, Asok, Asoka, Jasundi ; *Burma* : Thawgabo, Thawka ; *Canarese* : Achenga, Akshath, Ashanke, Ashoka, Ashuge, Asoka, Kenkali, Kusge ; *Cuttack* : Aseka, Ati ; *English* : Asoka Tree ; *Gujerati* : Ashopalava ; *Hindi* : Ashok, Asok ; *Kolami* : Husangidba, Usangidba ; *Konkani* : Assoc ; *Malayalam* : Asoka, Hemapushpam, Vanjulam ; *Manipur* : Asoka ; *Marathi* : Ashoka, Jasundi ; *Mundari* : Husanggidhadaru ; *North-Western Provinces* : Asok ; *Punjab* : Asok ; *Sanskrit* : Ashoka, Kankali, Kankelli, Vanjula, Vanjuldruma, Vishoka, Vitashoka ; *Sinhalese* : Diyaratmal, Diyeratembela ; *Tamil* : Asogam, Asogu, Anagam, Malaikkarunai, Sasubam ; *Telugu* : Asokamu, Vanjulamu ; *Uriya* : Osoko.

Standardised plant name, U.S.A.—Common Saraca.

THE LARGE-FLOWERED NIGHTSHADE OR POTATO TREE

SOLANUM GRANDIFLORUM *Ruiz & Pavon*, Fl. Peruv. **2**, 34, t. 168 (1799) ; Bitter in Fedde, Repert. Beih. **16**, 180 (1923).
Syn. *Solanum Wrightii* Bentham, Fl. Hongkong, 243 (1861).

This tree has long been known in Bombay as *Solanum macranthum*, the epithet "large-flowered" from Greek μακρος [mākrŏs], "long, large," ανθος [anthos], "flower," being very appropriate, but examination at Kew by Mr C. E. C. Fischer of specimens sent from Bombay

showed it was incorrectly identified and that it belonged to *Solanum Wrightii* Benth. This commemorates Charles Wright (1811-1885), U.S. naturalist who collected in Hong Kong in 1854 and 1855. The plant is, however, not a native of Hong Kong but a South American species long cultivated in the East and often called *S. macranthum*. The confusion between the two was pointed out by

Large-flowered Nightshade or Potato Tree

Solanum grandiflorum

Hemsley in *Gard. Chron.*, iii, 7, 75 (Jan. 1890). They belong to the family *Solanaceae*, of which the Potato is the best known representative but which also includes Tobacco (*Nicotiana*) and Tomato (*Lycopersicon*). The name *Sōlānum*, originally applied to the Black Nightshade (*S. nigrum*), is presumed to be from the Latin *solatium*, " comfort, relief, solace," because of narcotic properties. According to Georg Bitter, *S. Wrightii* is conspecific with *S. grandiflorum* and the earlier name has accordingly been adopted here on his authority.

Description.—A shrub or small tree occasionally reaching a height of 30 to 40 ft. with yellowish-brown straight prickles. Leaves large, 10 to 15 in. long, sometimes narrowing at the base forming a winged leaf-stalk. The leaf is slightly heart-shaped, egg-shaped, lance-shaped, or elliptically lance-shaped, with deeply cut angles or lobes. It is paler beneath, covered with fine star-like hairs. The young leaves and shoots are densely covered with the same covering. The leaves on the under surface are strongly armed with long prickles arranged at intervals along the nerves. The flowers are arranged in simple or branched bunches 3 to 5 in. long, from 7 to 12 in number. The corolla is bluish-violet, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. in diameter ; the lobes are sharply pointed. The anthers are large and yellow. The fruit is almost rounded, the size of a golf ball.

Distribution.—The Large-flowered Nightshade or Potato Tree is a native of South America (Bolivia, Peru).

Gardening.—This plant is widely cultivated in gardens for its large showy flowers and beautiful leaves ; it flowers all the year round. It is easily propagated from seed or cuttings and thrives best in sheltered and partially shaded situations, up to 3000 ft. or higher if not exposed to strong winds. It was first introduced into Ceylon in 1844.

Standardised plant name, U.S.A.—Potato Tree Nightshade.

THE SCARLET-BELL OR FOUNTAIN TREE

SPATHODEA CAMPANULATA *Palisot de Beauvois*, Fl. d'Oware et de Benin, 1, 47, tt. 27-28 (1805).

The generic name *Spathodea* is derived from the Greek σπάθη [spăthē], "blade, flower-sheath,"—ώδης [-ōdēs], "of the nature of, like," in allusion to the spathe-like calyx. The epithet *campanulata* describes the bell-shaped corolla. Spathodeas, of which there are two or three species, are handsome evergreen trees with large pinnate leaves, and very showy orange-red or scarlet flowers. They belong to the *Bignoniaceae*.

Description.—This is one of the most glorious trees in Bombay gardens. Tall and erect, it grows to a height of 70 ft. Although a large tree in Bombay, it attains finer proportions in Bangalore, where it has not to contend against the high winds which prevail in Bombay during the monsoon. In the drier areas the tree is deciduous for a few weeks during the hot weather, but in the humid climate of the west coast it remains evergreen.

Scarlet-bell Tree

Spathodea campanulata

40. Flowers of the Large-flowered Nightshade or Potato Tree (*Solanum grandiflorum*).

N. H. Wandrekar

41. The Large-flowered Nightshade or Potato Tree (*Solanum grandiflorum*).

42. A Scarlet-bell Tree (*Spathodea campanulata*) at Singapore.

43. A flowering branch of the Scarlet-bell Tree (*Spathodea campanulata*).

The tree has a large compound leaf, which is odd-pinnate. The leaflets or pinnae grow opposite each other along the main axis, which ends in a terminal pinna. There are from 9 to 19 smooth, oval, abruptly pointed leaflets. They have very short stalks and bear from 2 to 3 fleshy glands at the base. The shoots are velvety, the young leaves somewhat hairy beneath. During the cold weather the velvety olive-green buds appear in huge clusters at the tips of branches. They are close packed, curved over one another and form a compact globular mass which expands into a great panicle of lovely erect blooms, crowning the tree with a blaze of orange and crimson. Its vivid beauty compels attention. From its curving, boat-shaped calyx the corolla emerges as a short tube which abruptly expands into a wide bell some 4 in. long. The lobes of its petals are oval in shape and somewhat wavy. Externally the flower is orange at the base, deepening rapidly into brilliant crimson. It is edged with a fine yellow margin. Within, it is a rich yellow cup heavily streaked with red. The 4 yellow, protruding stamens are capped with pendant brown anthers. At the base of the style is the oblong papillose ovary containing ovules packed in several rows.

The fruit is a smooth, woody, oblong, lance-shaped capsule, pointed at both ends. The seeds are elliptic, broadly winged. The trees do not often produce seed in Bombay and very rarely do so in Ceylon.

Flowering season.—In Ceylon the trees flower throughout the wet season. In Bombay chiefly during the cold weather, particularly in February and March, some individuals during the rains in September and October. In Angola the trees flower from September to the end of May, and fruit in June and July.

Distribution.—The Scarlet-Bell Tree is a native of tropical Africa. It was introduced into Ceylon in 1873. There seems to be no record of when it was introduced into India.

In Africa it is widely spread from Sierra Leone to the Congo and Angola, extending to Uganda.

Gardening.—For scenic planting in extensive grounds

this is one of the finest trees in the country. Clusters of these trees make the expansive lawns of the Willingdon Sports Club, Bombay, radiant during the cold weather. The tree thrives well up to an altitude of 4000 ft. and is suited to districts where the rainfall is not too great. It can easily be propagated from root suckers which appear freely round the base of the tree, or from cuttings ; it may also be raised from seed. It demands rich and well-drained soil with sufficient moisture during the growing period.

Uses.—The tree is useful for shade and makes a splendid avenue ; it is a fine decorative tree.

The liquor obtained by boiling the centre of the fruits when they are hard is poisonous and used by native hunters to procure meat.

The tree is such a poor firewood that the fact has been recorded in the form of an Ashanti proverb.

The two sides of blacksmiths' bellows are made from this tree.

The wood is white and very soft, its density 0·363. It is suitable for carpentry work and has been suggested for use in paper making. A specimen of the wood in the Kew Museum, grown in Madras, weighs 40 lb. per cubic foot. The softness of the wood is proverbial on the Gold Coast, where its name is used to designate weak people.

The buds are popularly used by the native boys as water-squirts.

Vernacular names.—The terms " Squirt " and " Fountain Tree " in English, " Nirukayi " in Canarese, " Korkornsu " in Ashanti, " Adatsigo " in Ewe, refer to the liquid contents of the buds.

Accra : Osisirin, Seseru ; *Angola* : Sambi-sambi ; *Ashanti* : Korkoranidua, Kokornsu, Osisiriro ; *Baganda* : Kifabakasi ; *Benin* : Okwokwi ; *Canarese* : Nirukayi ; *Congo* : Mombata ; *English* : African Tulip Tree, Fountain Tree, Scarlet-bell Tree, Squirt Tree, Tulip Tree ; *Ewe* : Adatsigo ; *French* : Tulipier du Gabon ; *Gold Coast* : Odoumanki ; *Golungo Alto* : Andenandua, Mangelandua, Mutenandua, Mutenguenandua, Ndemand ; *Ivory Coast* : Gouro, Kokomayur, Nkokion ; *Krobo* : Votso ; *Lagos* : Oruru ; *Lakolela* : Mombata ; *Mbonoi* : Kokomayur ; *Sierra Leone* : Tchioge ; *Telugu* : Patade, Patadiya ; *Twi* : Osisiriw ; *Uganda* : Kifabakasi ; *Yoruba* : Oruru.

Standardised plant name, U.S.A.—Bell Flambeau Tree.

44. The Wavy-leaved Tecomella (*Tecomella undulata*) in flower.

C. McCann

45. Flowers of the Wavy-leaved Tecomella (*Tecomella undulata*).

Wavy-leaved Tecomella

Tecomella undulata

THE WAVY-LEAVED TECOMELLA

TECOMELLA UNDULATA (*Smith*) *Seemann* in Ann. Mag. Nat. Hist. III, 10, 30 (1862), Journal of Botany, 1, 18 (1863).

Syn. *Bignonia undulata* Smith, Exotic Bot. 1, 35 (1805)—*Tecoma undulata* (Smith) G. Don, General Syst. 4, 223 (1838) ; Hooker f., Fl. Brit. India, 4, 378 (1884).

This belongs to the family *Bignoniaceae*. *Tecomella* is a diminutive of the generic name *Tecoma*, itself derived from the Mexican name of a plant : *Tecomaxochitl* (*tecomatl* = vessel ; *xochitl* = flower).

Description.—A large shrub or small tree with drooping branches and greyish-green foliage. Leaves 2 to 5 by $\frac{3}{8}$ to $1\frac{1}{4}$ in., narrowly oblong, blunt at the apex and with wavy margins, covered with minute hairs and slightly rough ; leaf-stalk 1 in. long. Flowers large, from pale yellow to deep orange, inodorous, in smaller or larger 5 to 10 flowered bunches at the ends of the smaller lateral branches ; stalks $\frac{1}{4}$ to $\frac{1}{2}$ in. long ; calyx cup-shaped with 5 almost equally rounded lobes, veined. Stamens 4 ; filaments smooth. Stigma divided into two lobes. Fruit 8 in. long by $\frac{3}{8}$ in. broad, slightly curved, parallel-sided, smooth and sharply pointed at the tip. Seed winged 1 by $\frac{3}{8}$ in. (including the wing) ; wing thin, very narrow, rounded at the top and absent at the base of the seed.

Distribution.—India, Western Peninsula, Punjab, Rajputana, Baluchistan ; Arabia.

Gardening.—A very handsome tree when in full bloom and really worthy of cultivation. It is easily propagated from seed or cuttings (Troup). It is not uncommon in the drier tracts of India, flowering between February and April.

Economic value.—The plant is said to yield a gum. In Las Bela the bark is used for tanning skins.

The foliage is greedily browsed by cattle ; the leaves are used as a fodder for goats in Las Bela. The wood is strong, tough and durable ; it takes a fine polish, and is

highly prized for furniture (Watt, *Dict. Econ. Prod.*). The wood is yellowish-brown, mottled, handsome, highly prized for furniture, carving and agricultural implements (Brandis). It is drought-hardy and very resistant to fire. It would be a useful species for afforesting dry tracts (Troup). At Wad in Kalat it is used for making basins.

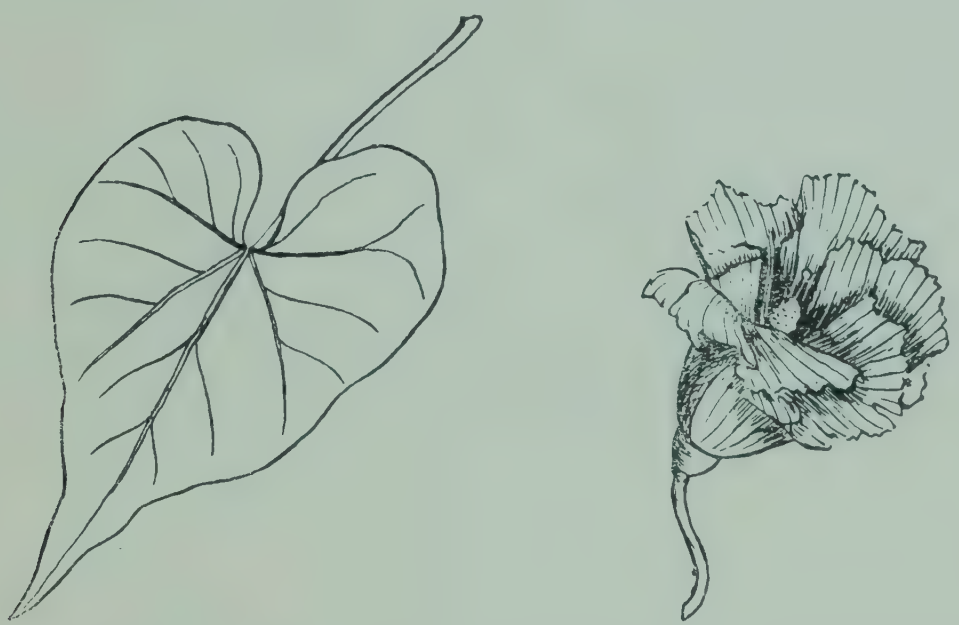
Popular names.—Baluchistan : Parpuk, Rori ; *Bolan* : Parpuk ; *Bombay* : Lohero, Lohuri, Rakhtreora, Roira, Rugtrora ; *Brahui* : Parpuk ; *Hindi* : Rugtrora ; *Jodhpur* : Rohera ; *Las Bela* : Lahiru ; *Marathi* : Rakhtreora, Rakhtroda, Raktarohida ; *Mashudi* : Ribdunh ; *Merwara* : Rohera, Roira ; *Punjab* : Lahura, Luar, Regdan, Reodhan, Rohira, Roir ; *Pushtu* : Raidawan, Rebdan, Rebdun, Regdewan, Reodan ; *Sanskrit* : Chalachhada, Kutashalmali ; *Sind* : Khen, Khew, Lahero, Lohera, Lohira, Lohuri ; *Wad* ; Parpuk ; *Waziri* : Ribdhvan.

THE BHENDI TREE

THESPESIA POPULNEA (*L.*) *Solander* ex Correa in Ann. Mus. Hist. Nat. Paris, **9**, 290 (1807) ; Hooker f., Fl. Brit. India, **1**, 345 (1874) ; Baker f. in Journal of Botany, **35**, 51 (1897).

Syn. *Hibiscus populneus* Linnaeus, Sp. Pl. **1**, 694 (1753)—*Bupariti populnea* (L.) Rothmaler in Fedde, Repert. **53**, 6 (1944).

The generic name is from the Greek θεσπέσιος [thĕspĕsios] "divinely decreed," hence "marvellous, oracular" ; it refers to *Th. populnea* being regarded as a sacred plant in Tahiti at the time of Captain James Cook's visit in 1769 and being grown around places used for worship. The epithet *pōpulnĕa* "of poplars" indicates the resemblance of the Bhendi's leaves to those of a poplar (*Populus*).



Description.—The tree reaches a height of 30 to 50 ft. Its smooth grey trunk is tall and straight. Its numerous branches form a heavy spreading crown of close-set foliage. The broad, heart-shaped leaves grow alternately about the ends of the branches. A single leaf is from 3 to 6 in. long. It has a fine tapering point, much like the leaf of our Pepul or of the Poplar. It is smooth, has a close network of fine veins and from 5 to 7 prominent

veins which radiate outwards from the base of the mid-rib. One or, at times, both sides of the leaf bear a few minute, ash-coloured scales, each carrying a dark central spot. The Bhendi is evergreen ; its change of leaf is gradual but is particularly marked in February, when many of the old leaves turn bright yellow and at a distance give the tree an appearance of being in bloom. The flowers are 3 to 4 in. across. They grow singly or in pairs. The pale lemon-yellow blooms with a deep maroon centre are very beautiful. When withering they fade gradually from salmon pink to a dull purple. The petals are finely crinkled and are set in a cup-like calyx. The long style

grows through a tube, decked with a cluster of golden-headed stamens. It is crowned with a club formed of five close-set stigmas. The globular turban-shaped fruit is cupped at its base in the calyx which persists after the petals have fallen. It contains 5 cells, each packed with from 1 to 3 down-covered egg-shaped seeds. The fruits are green at first but turn brown and then black with age. They remain for a long time on the tree. The flower and fruit have the aspect of the *Hibiscus*, in which genus of plants the Bhendi was formerly included, but the close-set stigmas, woody character of the fruit and flat egg-shaped seeds are characteristic of *Thespesia*.

Flowering season.—The tree flowers throughout the year but particularly at the beginning of the cold season.

Distribution.—It grows wild along the beach and tidal forests of our west coast from the Konkan southwards, on the coasts of Chittagong and the Andamans. It is widespread on the tropical shores of Asia, Africa and Oceania.

Gardening.—The Bhendi is a common roadside tree

Bhendi Tree

Thespesia populnea

46. Flowers of the Bhendi Tree (*Thespesia populnea*).

47. The Bhendi Tree (*Thespesia populnea*).

on the Bombay side of India. It prefers a light porous soil and is easily raised from seed or cuttings and grows quickly. When grown from cuttings, as most trees appear to be, they are crooked and distorted but the handsome heart-shaped leaves and large tulip-like flowers make this tree very noticeable.

Economic value.—The tree is valued for its tough, fine-grained timber which is used for the manufacture of gun-stocks, cartwheels and, because of its resistance to water, in boat-building. The bark yields a fine tough fibre which appears to be rarely employed in India except in the rough state for tying bundles of wood ; it is used in Burma for cordage, and in Demerara for making coffee bags.

Both the bark and the heartwood contain tannin and a fine red colouring matter. The flowers and fruits yield a yellow dye not unlike gamboge ; on the Gold Coast it is sometimes smeared on the skin or used as a paint by children.

The leaves are used for wrapping food.

The seeds yield a deep, red-coloured and somewhat thick oil, known as " huile amère."

Medicinal properties and uses.—The viscid, yellow juice in which the fruit abounds is also used as an external application in scabies and other cutaneous diseases. Experiment has however shown that in most instances it produces little or no benefit. The leaves are applied as poultices to swellings, sores and abscesses. A decoction of the bark is used as a wash for skin diseases and is given internally as an alternative. The root is taken as a tonic.

The deep red heartwood is spoken of as a remedy in heart attacks and in a kind of pleurodynia which is prevalent among the Malays.

Vernacular names.—Ahanta : Tamsi ; *Bengal* : Dumbla, Gajashundi, Palaspipal, Parash, Pares, Paresh, Parespipal, Porash, Prash ; *Bombay* : Bhendi, Bhindi, Palaspiplo, Parsipu ; *Bougainville Straits* : Kaikaia ; *Canarese* : Arasi, Asha, Bangali, Bugari, Gandarali, Hurvashi, Huvarasi, Jogiyarale, Kandasola ; *Central Provinces* : Ranbhendi ; *Ceylon* : Karavachu, Suriyagas ; *Cuba* : Majagua de Florida ; *Deccan* : Paraspippal, Paris ; *English* : Bhendi Tree,

Portia Tree, Tulip Tree, Umbrella Tree ; *Ewe* : Borborsenya ; *Fanti* : Adormba, Frefi ; *Fiji* : Mulo ; *French* : Porcher ; *Ga* : Adengkra, Fairtsho, Foz ; *Gilbert Islands* : Bengibeng ; *Guam* : Kilulu, Quilulu ; *Gujerati* : Bendi, Bhindi, Parasapiplo ; *Hawaii* : Milo ; *Hindi* : Bhendi, Gajadanda, Gajhand, Parashajhad, Paraspipal, Parispipul, Parsipu, Pipal, Pippul, Porush ; *Honduras* : Cork Tree ; *Hova* : Valo ; *Indo-China* : Chrey sramol, Tra bo de, Tra bua, Tra lam vo ; *Konkani* : Benddy, Maner ; *La Reunion* : Porcher ; *Malay* : Baru, Buah keras laut ; *Malayalam* : Chandamaram, Chilanti, Kallal, Pupparutti, Puvarasu, Puvvarasha ; *Marathi* : Bendi, Bhenda, Bhendi, Paraspipar, Parsachajhada, Ranbhendi ; *New Caledonia* : Bois de rose, Daleni, Kabaoui ; *Nzima* : Eijan ; *Ponape* : Pana, Pena, Pona ; *Porebunder* : Paraspiplo ; *Porto Rico* : Palo de jagueca ; *Portuguese* : Pau rosa, Pau de rosa ; *Punjab* : Paharipipal, Paraspipal ; *Rarotonga* : Miro ; *Sakalave* : Valomena ; *Samoa* : Milo ; *Sanskrit* : Gardabhanda, Kamandalu, Kandarala, Kapichuta, Kapitana, Kuberaksha, Kundah, Nandi, Parisha, Phalisha, Suparshvaka ; *Sinhalese* : Gansurigaha, Suriya, Suriyagaha ; *Sunderbunds* : Dumbla ; *Tagalog* : Baboigubat, Babuy, Banalo, Boboigubat, Bubuygubat, Malasantol, Malibago ; *Tahiti* : Milo ; *Tamil* : Kallal, Piram, Pupparutti, Puvarasu ; *Telugu* : Gangaravi, Gangareni, Munigangaravi ; *Tonga* : Milo ; *Tulu* : Jogi, Jogiyattasa ; *Twi* : Ayedru, Benorsenya ; *Uriya* : Gunjausto, Habali, Porosopippoli ; *Visayan* : Bulacan ; *Yap* : Bonabeng.

Standardised plant name, U.S.A.—Portia Tree.

Malvaceae

The Mallow family is more especially tropical, its members diminishing rapidly as they recede from the Equator ; they are more numerous in the northern tropics and in America than in the Old World. Among ornamental trees may be mentioned *Thespesia* and *Kydia*.

APPENDICES

DESCRIPTIONS OF FAMILIES REPRESENTED

THE following list of the botanical families (formerly known as natural orders) to which the genera represented in the preceding pages belong shows their arrangement and characters as set forth in J. Hutchinson's *Families of Flowering Plants, Dicotyledons* (1926), his numbering being retained. Families with numbers close together are likely to be more closely akin than those with numbers far apart. Names of families usually end in *-aceae* and those of orders in *-ales*. "B.H." below refers to Bentham and Hooker, *Genera Plantarum*, (1862-83) : "E.P." to Engler and Prantl, *Die natürlichen Pflanzenfamilien* (1887-1914). Under each family are listed the wild or cultivated tree-producing genera by which it is represented in the subcontinent of India (*i.e.* political India and Pakistan considered together).

10. CAPPARIDALES

36. CAPPARIDACEAE : Herbs, shrubs or trees, sometimes scandent ; leaves alternate or rarely opposite, simple or digitately 3-7-foliolate ; stipules when present minute or spiny ; flowers mostly hermaphrodite, actinomorphic or rarely zygomorphic, hypogynous, axillary or terminal, variously arranged ; sepals free or partially united, imbricate or valvate, usually 4 ; petals 4 to many or absent ; torus elongated or short, rarely with an appendix ; stamens few to many, sometimes some of them without anthers ; filaments sometimes partially adnate to the torus ; anthers 2-celled, longitudinally dehiscent ; ovary sessile or more usually supported on a *long or short gynophore*, 1-celled with parietal placentas or divided into 2 or more cells by spurious dissepiments ; ovules few to many ; fruit a capsule or a berry, sometimes the latter elongate or torulose ; seeds usually reniform or angular ; *endosperm none or scanty* ; embryo *arcuate* or *incurved*. B.H. 1 : 103 (1862) ; E.P. 3, 2 : 209 (1891). Tropics mainly. —CRATAEVA (p. 47) ; other arborescent genera in India, *Capparis*, *Niebuhria*.

20. GERANIALES

66. ZYGOPHYLLACEAE : Shrubs or herbs woody at the base, rarely trees ; branches often jointed at the nodes ; leaves opposite or alternate, *2-foliolate or pinnate*, rarely 3-foliolate, not gland-dotted ; *stipules paired*, persistent, often spinescent ; flowers rarely blue, hermaphrodite, actinomorphic or zygomorphic ; sepals 5, rarely 4,

free or rarely connate at the base, imbricate, rarely valvate ; petals 4-5, rarely absent, hypogynous, free, imbricate or contorted, rarely valvate ; *disk mostly present* ; stamens the same number as to triple the number of the petals, often unequal in length ; filaments free, often *with a scale inside* ; anthers 2-celled, opening lengthwise ; ovary superior, sessile or rarely stipitate, usually 4-5-celled, cells rarely transversely locellate ; style simple, short, or stigmas sessile ; ovules 2 or more in each cell, axile ; fruit various but *never baccate* ; seeds mostly with some endosperm ; embryo as long as the seed, straight or slightly curved. B.H. 1 : 262 (1862) ; E.P. 3, 4 ; 74 (1890). Mainly tropical and subtropical regions, often in dry desert places. —GUAIACUM (p. 90).

21. LYTHRALES

72. LYTHRACEAE : Herbs, shrubs or trees ; leaves *opposite or verticillate*, rarely alternate ; stipules *absent* or very small ; flowers usually actinomorphic, hermaphrodite, solitary to paniculate ; sepals *united into a tube*, *valvate*, often with *appendages* between the lobes ; petals present or absent, inserted towards the top of the calyx-tube, *crumpled* in bud ; stamens usually 4 or 8, rarely more, inserted below the petals ; filaments *variable in length*, usually *inflexed* in bud ; anthers 2-celled, opening lengthwise ; ovary superior, sessile or shortly stipitate, completely or incompletely 2-6-celled (rarely 1-celled) ; style simple, variable in length ; ovules numerous on an axile placenta sometimes not reaching the top of the ovary ; fruit usually capsular, opening by a transverse slit, by valves, or irregularly ; seeds numerous, without endosperm ; embryo straight. B.H. 1 : 773 (1867) ; E.P. 3, 7 : 1 (1892). Widely spread.—LAGERSTROEMIA (p. 100) ; other arborescent genus in India, *Lawsonia*.

24. DILLENIALES

85. DILLENIACEAE : Trees, shrubs or twiners, rarely undershrubs or herbs with radical leaves ; leaves alternate, entire or dentate, rarely pinnatifid or trilobed, usually with numerous prominent *parallel lateral nerves* ; stipules absent or winglike and *adnate* to the petiole, mostly deciduous ; flowers small to medium-sized, rarely large, hermaphrodite or male and female separate ; sepals 5, *much imbricate*, *persistent* ; petals 5 or fewer, imbricate, often *crumpled* in bud, deciduous ; stamens *numerous*, rarely definite, *hypogynous*, free or variously united into bundles at the base, *usually persistent* ; anthers with lateral or introrse cells, opening lengthwise or by apical pores ; carpels free, rarely one ; ovules 1 or more, erect from the base or from the inner angle of the carpel ; styles free ; carpels dehiscent or baccate ; seeds mostly with a *crested or laciniate aril* ; *endosperm copious*, fleshy ; *embryo minute*. B.H. 1 : 10 (1862) ; E.P. 3, 6 : 100 (1893). Mostly tropical and subtropical regions.—DILLENIA (p. 60).

27. BIXALES

92. Cochlospermaceae : Trees, shrubs or rhizomatous subshrubs with *coloured juice* ; leaves alternate, palmatilobed, *stipulate* ; flowers hermaphrodite, showy, paniculate or racemose ; sepals 5, imbricate, deciduous ; petals 5, imbricate or subcontorted ; stamens numerous, the filaments free, equal or some longer than others ; anthers 2-celled, linear, opening by terminal short, often confluent, *pore-like slits* ; ovary 1-celled with *parietal placentas* projecting into the cell, or perfectly 3-celled ; ovules numerous ; style simple with minutely denticulate stigma ; fruit a 3-5-valved capsule ; seeds glabrous or covered with *woolly hairs*, straight or *cochleate-reniform* ; endosperm copious ; embryo conforming to the shape of the seed, large ; cotyledons broad. B.H. 1 : 122 (1862) under Bixineae; E.P. Nachtr. 251 (1897). Tropics.—Cochlospermum (p. 38).

35. TILIALES

130. Sterculiaceae : Trees or shrubs with mostly soft wood, or rarely herbs ; indumentum often *stellate* ; leaves alternate or very rarely subopposite, simple or digitately compound ; stipules usually present ; flowers variously arranged, but inflorescence rarely terminal, hermaphrodite or male and female separate, actinomorphic ; sepals 3-5, more or less partially united, *valvate* ; petals 5 or absent, hypogynous, free or adnate at the base to the staminal-tube, *contorted-imbricate* ; stamens often *connate into a tube* with as many staminodes, sometimes in more than one series, or the stamens quite free ; *anthers 2-celled*, very rarely the cells subconfluent at the apex ; ovary free, of 2-5 or rarely 10-12 more or less united carpels or reduced to one carpel ; ovules 2 or more in each cell, rarely 1, inserted on the inner angle, ascending or horizontal ; style simple or divided into lobes or rarely the styles free from the base ; fruit dry or rarely baccate, indehiscent or variously dehiscent ; seed with fleshy or thin or no endosperm ; embryo straight or curved. B.H. 1 : 214 (1862) ; E.P. 3, 6 : (1890). Mainly tropics and sub tropics.—Firmiana (p. 79), Kleinhovia (p. 95) ; other arborescent genera in India, *Abroma*, *Eriolaena*, *Guazuma*, *Heritiera*, *Melochia*, *Pterospermum*, *Pterygota*, *Sterculia*, *Theobroma*.

131. Bombacaceae : Trees with sometimes bulging stems through excess of water storage ; leaves simple or digitate, alternate, often lepidote ; stipules deciduous ; flowers hermaphrodite, large and showy ; calyx closed and *valvate* in bud or rarely deeply 5-lobed with slightly imbricate lobes, often subtended by an epicalyx ; petals often elongated, sometimes absent ; stamens free or *united into a tube* ; anthers reniform to linear, *1-celled* ; pollen smooth ; ovary superior, 2-5-celled ; style simple, capitate, or lobed ; ovules 2 or more on the inner angle of each cell ; capsule loculicidally dehiscent or not dehiscent, the valves rarely falling away ; seeds often embedded in

hairs from the wall of the fruit, with little or no endosperm and flat or contorted or plicate cotyledons. B.H. 1 : 209 (1862) under Malvaceae ; E.P. 3, 6 : 53 (1890). Tropics.—SALMALIA (p. 122) ; other arborescent genera in India, *Adamsonia*, *Ceiba*.

36. MALVALES

132. MALVACEAE : Herbs or shrubs, often with fibrous stems ; indumentum usually stellate or lepidote ; leaves alternate, entire or variously lobed, mostly palmately nerved ; stipules present ; flowers actinomorphic, hermaphrodite, or rarely dioecious or polygamous ; sepals 3-5, more or less united, *valvate*, sometimes subtended by an *involucre* of *bracteoles* (epicalyx) ; petals 5, free from each other, but often adnate at the base to the staminal-column, contorted or imbricate ; stamens numerous, hypogynous, *monadelphous*, the staminal-column divided at the apex and bearing 1-*celled anthers* (by the division of the filaments), opening lengthwise ; pollen muricate ; ovary 2- or more-celled, often 5-celled, rarely of 1 carpel, or rarely the carpels in vertical rows ; style branched above, rarely clavate ; ovules 1 or more from the inner angle at each cell ; fruit dry, rarely baccate, breaking into cocci, or capsular ; seed with usually some endosperm and straight or curved embryo ; cotyledons often plicate or contortuplicate. B.H. 1 : 200 (1862) partly ; E.P. 3, 6 : 30 (1890). Throughout the world except very cold regions.—KYDIA (p. 97), THESPESIA (p. 141) ; other arborescent genus in India, *Hibiscus*.

41. LEGUMINOSAE

146. CAESALPINIACEAE : Trees, shrubs or rarely herbs ; leaves pinnate or bipinnate, rarely simple or 1-foliolate ; stipels mostly absent ; flowers mostly showy, racemose, spicate, or rarely cymose, *zygomorphic*, rarely sub-actinomorphic ; sepals 5 or the 2 upper ones connate, mostly free, imbricate or rarely valvate ; petals 5 or fewer or absent, the adaxial (upper) one *inside*, the others variously imbricate ; stamens mostly 10, very rarely numerous, often free or variously connate ; anthers various, sometimes opening by terminal pores ; ovary superior, 1-celled ; seeds with copious, thin or no endosperm and large embryo. B.P. 1 : 562 (1865) ; E.P. 3, 3 : 125 (1892) under Leguminosae. Mainly tropics.—AMHERSTIA (p. 1), BAUHINIA (p. 4), CASSIA (p. 19), COLVILLEA (p. 42), DELONIX (p. 52), PELTOPHORUM (p. 109), SARACA (p. 130) ; other arborescent genera in India, *Acrocarpus*, *Brownea*, *Caesalpinia*, *Cynometra*, *Haematoxylon*, *Hardwickia*, *Humboldia*, *Parkinsonia*, *Schizolobium*, *Tamarindus*.

148. PAPILIONACEAE : Herbs, shrubs or trees ; leaves simple or compound ; flowers zygomorphic, mostly hermaphrodite ; sepals usually 5, more or less connate into a tube ; petals 5, imbricate, free, the upper (adaxial) exterior and forming the *standard*, the two

lateral (*wings*) more or less parallel with each other, the lower two interior and connate by their lower margins into a *keel* ; stamens inserted with the petals, often 10, monadelphous or diadelphous, mostly all perfect ; anthers mostly opening lengthwise ; fruit usually dehiscent ; seeds without or with very scanty endosperm. B.H. 1 : 465 (1865) ; E.P. 3, 3 : 184 (1892) under Leguminosae. General distribution.—BUTEA (p. 12), ERYTHRINA (p. 63), GLIRICIDIA (p. 87), PTEROCARPUS (p. 119) ; other arborescent genera in India, *Brya, Castanospermum, Dalbergia, Millettia, Mundulea, Ormosia, Ougeinia, Pongamia, Sesbania.*

65. APOCYNALES

230. APOCYNACEAE : Trees, shrubs or climbers, rarely perennial herbs ; leaves *opposite* or *verticillate*, rarely alternate, simple, entire ; *stipules absent* ; flowers hermaphrodite, actinomorphic ; calyx often *glandular inside* ; lobes 5 or rarely 4, *imbricate* ; corolla tubular, variously shaped ; lobes *contorted-imbricate*, very rarely valvate ; stamens 5 or rarely 4, inserted in the tube ; filaments free or rarely united ; anthers often *sagittate*, free or connivent around the stigma, rarely adherent to the latter, 2-celled, opening lengthwise, connective often *produced at the apex* ; pollen *granular* ; disk usually present, annular, cupular or of separate glands ; ovary superior, 1-celled with 2 *parietal* placentas or 2-celled with the placentas adnate to the septa, or carpels 2 and free or connate only at the base with ventral placentas in each carpel ; style 1, split at the base or entire, thickened and stigmatose below the apex ; ovules 2 or more in each carpel ; fruit entire and indehiscent or of 2 separate carpels, baccate, drupaceous or follicular ; seeds mostly with endosperm and large straight embryo, often winged or appendaged with long silky hairs. B.H. 2 : 681 (1876) ; E.P. 4, 2 : 109 (1895). Mainly tropics and subtropics.—PLUMERIA (p. 112) ; other arborescent genera in India, *Alstonia, Cerbera, Ervatamia, Holarrhena, Thevetia, Wrightia.*

66. RUBIALES

232. RUBIACEAE : Trees, shrubs or more rarely herbs ; leaves *opposite* or *verticillate*, entire or rarely toothed, simple ; stipules often *inter-* or *intra-petiolar*, free or connate, sometimes *leafy* and indistinguishable from the leaves ; flowers mostly hermaphrodite, very rarely slightly zygomorphic, solitary to capitate ; calyx adnate to the ovary ; corolla epigynous, more or less tubular ; lobes 4-10, contorted, imbricate or valvate ; stamens as many as corolla-lobes and *alternate with them*, inserted in the tube or at its mouth ; anthers mostly free, 2-celled, opening lengthwise ; *ovary inferior*, 2- or more-celled with axile, apical or basal placentation, rarely 1-celled with parietal placentas ; style often slender, variously lobed ; ovules 1 to many ;

fruit a capsule, berry or drupe ; seeds rarely winged, mostly with endosperm ; embryo straight or curved. B.H. **2** : 7 (1873) ; E.P. **4**, 4 : 1 (1891). Generally distributed, but mostly tropical.—GARDENIA (p. 83) ; other arborescent genera in India, *Adina*, *Anthocephalus*, *Canthium*, *Cephalanthus*, *Cinchona*, *Diplospora*, *Hymenodictyon*, *Ixora*, *Morinda*, *Octotropis*, *Randia*, *Stephegyne*, *Webera*, *Wendlandia*.

73. BORAGINALES

249. BORAGINACEAE : Herbs, shrubs or trees, glabrous or often scabrid or hispid ; leaves *alternate* or very rarely opposite, simple ; *stipules absent* ; flowers often in *scorpioid cymes*, actinomorphic or rarely oblique, mostly hermaphrodite ; calyx-lobes imbricate or rarely valvate ; corolla with contorted or imbricate lobes ; stamens the same number as the corolla-lobes and alternate with them, inserted on the corolla ; anthers 2-celled, opening lengthwise ; disk present or obsolete ; ovary superior, 2-celled or 4-celled by spurious septa, entire or *deeply 4-lobed* ; style terminal or from the middle of the lobes (*gynobasic*) ; ovules paired, *erect* or spreading from the central axis ; fruit a *drupe* or of 4 *nutlets* ; seeds with or without endosperm, and straight or curved embryo. B.H. **2** : 832 (1876) ; E.P. **4**, 3a : 71 (1893). Widely dispersed, numerous in the Mediterranean region. —CORDIA (p. 44) ; other arborescent genus in India, *Ehretia*.

74. SOLANALES

250. SOLANACEAE : Herbaceous or woody ; leaves *alternate*, simple ; *stipules absent* ; flowers hermaphrodite, mostly *actinomorphic* ; calyx 4-6-lobed, persistent ; corolla gamopetalous, usually 5-lobed, lobes folded, contorted or valvate ; stamens inserted on the corolla-tube and alternate with its lobes ; anthers 2-celled, cells parallel, opening lengthwise or by apical pores ; *ovary 2-celled*, the cells sometimes again divided by a false septum ; style terminal ; ovules very *numerous*, axile ; fruit a capsule or berry ; seeds with copious endosperm and curved or annular embryo. B.H. **2** : 882 (1876) ; E.P. **4**, 3b : 4 (1891). Generally distributed in temperate and tropical regions.—SOLANUM (p. 134).

75. PERSONALES

257. BIGNONIACEAE : Trees or shrubs, sometimes scandent, very rarely herbs ; leaves *opposite*, rarely alternate, mostly *compound*, digitate or pinnate, sometimes the terminal leaflet tendril-like ; stipules absent ; flowers often showy, hermaphrodite, more or less *zygomorphic* ; calyx campanulate, closed or open in bud, truncate or 5-toothed ; corolla with 5 imbricate lobes sometimes forming 2 lips, the upper of 2, the lower of 3 lobes ; stamens alternate with the corolla-lobes, only 4 or 2 perfect ; anthers *connivent in pairs* or rarely

free, 2-celled, opening lengthwise ; staminode representing the fifth stamen often short, sometimes absent, often 3 present when only 2 stamens ; disk usually present ; ovary superior, 2-celled with 2 placentas in each cell or 1-celled with 2 *parietal* bifid placentas ; style terminal, 2-lipped ; ovules *numerous* ; fruit capsular or fleshy and indehiscent ; seeds often *winged*, without endosperm ; embryo straight. B.H. **2** : 1026 (1876) ; E.P. **4**, 3b : 189 (1894). Tropics and subtropics.—JACARANDA (p. 93), MILLINGTONIA (p. 106), SPATHODEA (p. 136), TECOMELLA (p. 139) ; other arborescent genera in India, *Catalpa*, *Crescentia*, *Dolichandrone*, *Haplophragma*, *Heterophragma*, *Kigelia*, *Markhamia*, *Mayodendron*, *Oroxylum*, *Pajanelia*, *Parmentiera*, *Radermachera*, *Stereospermum*.

KEY TO THE GENERA

The following key aims to help in the identification of the genera represented in this book by giving a series of contrasted statements of their more important, constant and easily observed characteristics. Since these trees attract attention as a rule only when in flower, and may then be without leaves and fruits, the key is primarily based on floral characters. The statement in 1a contrasts with that of 1b ; 2a contrasts with 2b, and so on.

1a. Petals lacking. Calyx brightly coloured, apt to be mistaken for a corolla.

2a. Calyx glabrous : lobes 4, oval, spreading, petal-like. Stamens 4 to 7, free, conspicuously protruding. Leaves pinnate, with 4 to 6 pairs of leaflets. Fruit a pod. . . . . *Saraca* (p. 130)

2b. Calyx thickly hairy ; lobes 5, short, erect. Stamens joined into a tube, with about 20 to 30 inconspicuous anthers. Leaves simple, broader than long, with 3 to 5 pointed lobes. Fruit on a long stalk protruding from the persistent calyx and opening long before the seeds are ripe into 2 to 5 hanging leafy valves. . *Firmiana* (p. 79)

1b. Petals present, as well as the calyx (which may, however, fall quickly after the opening of the flower).

3a (for 3b, see p. 155). Petals free and distinct from one another, not joined together in the lower part.

4a. Flowers regular (*i.e.* capable of bisection along two or more planes into similar halves).

5a. Petals 6 or 7, long-clawed at base. Leaves simple. *Lagerstroemia* (p. 100)

5b. Petals 5

6a. Petals narrowed into a distinct claw (or stalk) at base. Leaves compound. . . See 20b below

6b. Petals not distinctly clawed at base.

7a. Flowers small, less than $1\frac{1}{4}$ in. across.

8a. 4 to 6 persistent sepal-like bracts below the calyx. Petals white. Stamens joined together in the lower part into a slender erect tube, then dividing into 5 spreading divisions, each 3-anthered. Leaves very broadly ovate, cordate. . . . . *Kydia* (p. 97)

8b. No bracts below the calyx.

9a. Flowers in a loose panicle. Petals pink. Leaves simple, very broadly ovate, often cordate. . . . *Kleinhovia* (p. 95)

9b. Flowers in an umbellate cluster. Petals blue. Leaves compound, usually with about 12 leaflets. . *Guaiacum* (p. 90)

7b. Flowers large, more than $1\frac{1}{4}$ in. across.

10a. Calyx quickly falling as the flower opens; sepals 5, distinct. Petals yellow. Style short; stigma small, slightly lobed. Leaves deeply lobed. *Cochlospermum* (p. 38)

10b. Calyx persistent.

11a. Stigma with 5 cohering lobes. Calyx truncate. Petals yellow, with a deep red centre, becoming purplish as they age. *Thespesia* (p. 141)

11b. Stigma with 5 to 15 distinct rays or lobes.

12a. Calyx cup-like, splitting slightly. Stigma with 5 distinct lobes. Leaves compound, divided into 3 to 9 digitately arranged leaflets. *Salmalia* (p. 122)

12b. Calyx with 5 distinct, much overlapping sepals. Leaves simple, elliptic. *Dillenia* (p. 60)

4b. Flowers irregular (*i.e.* divisible into equal halves along one plane only).

13a. Petals 4, long-clawed, white or yellowish. Stamens numerous (about 20). Ovary at the end of a long stalk (gynophore). Leaves with 3 leaflets. . *Crataeva* (p. 47)

13b. Petals 5. Stamens not more than 15

14a. Ovary 5-celled. Stamens joined into a tube; anthers 15. Petals very small (about $\frac{1}{5}$ in. long), pink. Leaves broadly ovate, often cordate, simple, not bilobed. . . . *Kleinhovia* (p. 95)

14b. Ovary 1-celled. Stamens joined or free; anthers 10 or less. Petals more than $\frac{2}{5}$ in. long. Leaves compound, with several or many leaflets, or if simple, then bilobed.

15a. Upper petal (standard) outermost. Flowers constructed on the same plan as those of a pea or bean. Stamens usually joined and enclosed within the lower two petals (keel) which are joined along their lower margin.

16a. Flowers large; petals to $1\frac{1}{2}$-2 in. long. Leaves with 3 leaflets.

17a. Petals very unequal, the upper petal (standard) much longer than the 2 side petals (wings) and the 2 lower petals (keel). *Erythrina* (p. 63)

17b. Petals almost equal in length, the upper petal (standard) equalling or little shorter than the 2 lower petals (keel). . . . *Butea* (p. 12)

16b. Flowers small ; petals not more than $\frac{4}{5}$ in. long. Leaves pinnate with 8 to 13 leaflets.

18a. Ovary with 7-12 ovules. Leaflets opposite one another, *i.e.* in pairs along the main leaf stalk (rhachis). Pod long, slender, many-seeded, not winged. . *Gliricidia* (p. 87)

18b. Ovary with 2-6 ovules. Leaflets not opposite but alternating along the two sides of the main leaf stalk (rhachis). Pod disc-like, with one or two seeds surrounded by a broad wing. . . *Pterocarpus* (p. 119)

15b. Upper petal innermost. Stamens conspicuously protruding. Flower usually rather open. Lower petals free, not forming a keel.

19a. Two large red conspicuous bracts on the pedicel a little below the flower. Stamens 10, one free, the others fused by their filaments with 5 anthers on long stalks alternating with 4 anthers almost sessile. Leaves pinnate with 6 to 8 pairs of leaflets ; no terminal leaflet.

Amherstia (p. 1)

19b. No large bracts below the flower. Stamens all free, not markedly unequal.

20a. Leaves with one leaflet divided $\frac{1}{4}$ to $\frac{1}{2}$ way down (*i.e.* 2 leaflets joined into 1 for $\frac{1}{2}$ to $\frac{3}{4}$ their length). Stamens 1, 3 or 10 ; anthers versatile. . *Bauhinia* (p. 4)

20b. Leaves with several or many leaflets

21a. Leaves simply pinnate. Anthers basifixed. . *Cassia* (p. 19)

21b. Leaves bipinnate. Anthers versatile.

22a. Sepals overlapping in bud. Petals more or less alike, spreading ; claw shorter than the blade.

Peltophorum (p. 109)

22b. Sepals touching along the edge but not overlapping in bud.

23a. Sepals spreading. Petals long-clawed, spreading, larger than the stamens, the blade in all of almost equal width, fan-shaped, conspicuous.

Delonix (p. 52)

23b. Sepals forming a cup. Petals short-clawed, the claw enclosed in the calyx, erect, shorter than the stamens, the blade of one petal much broader than the others.
Colvillea (p. 42)

3b. Petals joined together for the greater part of their length.
24a. Flower regular (*see* 4a above).
25a. Corolla saucer-shaped, 5-lobed. Anthers usually connivent and projecting as a narrow cone from the centre of the flower ; filaments very short. *Solanum* (p. 134)
25b. Corolla rather funnel-shaped, the lower part narrowly tubular.
26a. Petals 4 to 8, usually 6. Stigma with 4 recurved divisions. Calyx tubular or bell-shaped.
Cordia (p. 44)
26b. Petals 5. Stigma simple or two-lobed.
27a. Carpels forming a one-celled ovary. Flowers axillary. Leaves opposite. Branches slender.
Gardenia (p. 83)
27b. Carpels 2, distinct. Flowers in terminal corymbs. Leaves alternate. Branches very thick, forking. . . *Plumeria* (p. 112)
24b. Flower irregular (*see* 4b above).
28a. Calyx very large, 2 to $2\frac{3}{4}$ in. long, spathe- or boat-like, being slit along the upper side. Corolla large, orange-red, expanded from near the base into a curved bell up to $4\frac{1}{4}$ in. long. Leaves simply pinnate ; leaflets 9 to 19. . . . . *Spathodea* (p. 136)
28b. Calyx much smaller, $\frac{1}{12}$ to $\frac{5}{12}$ in. long, 5-lobed, not spathe-like.
29a. Calyx $\frac{1}{4}$ to $\frac{5}{12}$ in. long. Corolla broadly bell-shaped, 2 to $2\frac{3}{4}$ in. long, yellow or orange-red. Leaves undivided, narrowly oblong.
Tecomella (p. 139)
29b. Calyx about $\frac{1}{12}$ in. long. Corolla narrower, white or lavender. Leaves bipinnate ; leaflets 22 to 400.
30a. Corolla white, to $3\frac{1}{10}$ in. long ; tube narrow, to $2\frac{1}{4}$ in. long, scarcely widening below the spreading lobes. . . *Millingtonia* (p. 106)
30b. Corolla lavender, 1 to $1\frac{1}{2}$ in. long ; narrow basal part of tube about $\frac{2}{5}$ in. long, then gradually widening and quite inflated in the upper part. . . *Jacaranda* (p. 92)

CHANGES IN NOMENCLATURE

Comparison of the present work with the articles in the *Journal of the Bombay Natural History Society* (1929-36) on which it is based will reveal various changes in the scientific names adopted. Thus—

Bombax malabaricum is now *Salmalia malabarica.*
Bombax insigne is now *Salmalia insignis.*
Bombax scopulorum is now *Salmalia scopulorum.*
Bombax anceps is now *Salmalia anceps.*
Butea frondosa is now *Butea monosperma.*
Cassia marginata is now *Cassia Roxburghii.*
Cochlospermum Gossypium is now *Cochlospermum religiosum.*
Gardenia lucida is now *Gardenia resinifera.*
Gliricidia maculata is now *Gliricidia sepium.*
Lagerstroemia Flos Reginae is now *Lagerstroemia speciosa.*
Peltophorum ferrugineum is now *Peltophorum Roxburghii.*
Plumeria acutifolia is now *Plumeria rubra acutifolia.*
Poinciana regia is now *Delonix regia.*
Poinciana elata is now *Delonix elata.*
Solanum macranthum is now *Solanum grandiflorum.*
Sterculia colorata is now *Firmiana colorata.*

Nine of these result from reclassification. Thus the Potato Tree erroneously known in India as "*Solanum macranthum* Dunal" has been identified as belonging to another species. Following the Dutch monographer Bakhuizen van der Brink (1924), the genus *Bombax* has been divided and the Indian species referred to *Salmalia* (*Gossampinus*). Following Corner (1940), the genus *Firmiana* (including *Erythropsis*) has been separated from *Sterculia.* Following Woodson (1938), *Plumeria acutifolia* has been united with *P. rubra* though accorded varietal rank for garden purposes. The union of *Poinciana* with *Caesalpinia* and the recognition of certain species (*P. regia* and *P. elata*) as forming a distinct genus has brought the name *Delonix* into general use for this since 1905. The other changes are due to the adoption of the earliest available validly published specific epithet in accordance with the International Code of Botanical Nomenclature and are already familar to botanists concerned with tropical plants.

GLOSSARY OF SOME BOTANICAL TERMS

The descriptions in this book, being primarily intended for the use of flower-lovers with little or no detailed knowledge of botany, have been written in language as non-technical as possible, but the use of some botanical terms has proved unavoidable. Most of these are explained below. For the very numerous technical words used in standard floras, like that of Bengal by Prain and of Madras by Gamble and Fischer, the student should consult such a work as B. Daydon Jackson, *A Glossary of Botanic Terms* (Duckworth, London).

ACTINOMORPHIC : regular.

ANTHER : upper pollen-producing part of a stamen ; it is usually attached by the base (i.e. *basifixed*) or towards the middle of the back (i.e. *dorsifixed*) to a slender stalk (*filament*).

ARBORESCENT : becoming a tree ; (of genera) with members which become trees.

AREOLE : space on a leaf between veins by which it is surrounded and marked out.

ARIL : appendage on the seed formed by expansion of the funicle or stalk of the ovule.

AXILE : attached to the axis or centre.

AXILLARY : growing out of the *axil* or angle between the upper side of the base of a leaf and the stem supporting it.

BACCATE : berry-like.

BASIFIXED : attached by the base.

BIPINNATE : with both primary and secondary division of the leaf pinnate ; compare the bipinnate leaves of *Delonix* (p. 52), *Jacaranda* (p. 93) and *Peltophorum* (p. 109) with the simply pinnate leaves of *Cassia* (p. 19), *Gliricidia* (p. 87) and *Spathodea* (p. 136) which have no secondary divisions.

BLADE : broadened part of a stalked leaf or clawed petal.

BRACT : modified leaf intermediate in position and sometimes in form between the true leaves and the calyx of the flower.

CALYX : outer part of the flower, often green, but sometimes brightly coloured, e.g. *Firmiana* (p. 79) and *Saraca* (p. 130), often persisting longer than the petals, e.g. *Dillenia* (p. 60), but sometimes falling early, e.g. *Cochlospermum* (p. 38) ; it may consist of several free segments (*sepals*) or be tubular and only partly divided into *calyx-lobes*.

CAMPANULATE : bell-shaped.

CAPSULE : seed-vessel dry at maturity which breaks open (*dehisces*) to liberate the seeds.

CARPEL : division of the pistil, comparable to a single leaf ; often the pistil consists of only one carpel ; the carpels may be distinct or joined into one organ.

CLAW : long narrowed base or stalk of certain petals, e.g. *Crataeva* (p. 47), *Delonix* (p. 52) and *Lagerstroemia* (p. 100).

COMPOUND LEAF : leaf divided into several or many leaflets ; compare the compound leaves of *Crataeva* (p. 47), *Salmalia* (p. 122), *Cassia* (p. 19), *Spathodea* (p. 136), *Jacaranda* (p. 93) with the simple leaves of *Cochlospermum* (p. 38), *Lagerstroemia* (p. 100).

CONNATE : joined together.

CONTORTED : twisted, one part being rolled up in another.

COROLLA : petals of an individual flower considered as a whole, whether distinct and independent or joined together.

COTYLEDON : seed leaf.

DEHISCENT : splitting, breaking open.

DIADELPHOUS : with the stamens in two groups, *i.e.* usually one stamen free, the others joined together by their filaments.

DISK : enlargement of the torus.

DISSEPIMENT : partition within the ovary.

DORSIFIXED : attached on the back above the base.

ENDOSPERM : food-store in the seed outside the embryo.

EXTRORSE : turned outward.

FAMILY : group of genera.

FILAMENT : lower anther-bearing part of a stamen.

FOLLICLE : dry fruit or seed-vessel, formed from a single carpel, opening along one side (*ventral suture*).

FRUIT : mature seed-bearing body, not necessarily edible or succulent ; a pod (*legume*) is a fruit.

GENUS : natural group comprising one, several or many species ; the first part of a two-word botanical name is the generic name, e.g. *Cassia* (generic name), *javanica* (specific epithet) ; the generic name and specific epithet together make the specific name, e.g. *Cassia javanica*.

GYNOPHORE : basal stalk-like part of the pistil bearing the ovary and arising within the calyx, e.g. *Crataeva* (p. 47), *Firmiana* (p. 79) ; in most plants the ovary has no gynophore and is stalkless (*sessile*), e.g. *Salmalia* (p. 122) ; it should not be confused with the pedicel or flower-stalk which ends below the calyx.

HELICOID : coiled like a snail-shell.

HERMAPHRODITE : having male and female organs, *i.e.* stamens and pistil, in the same flower.

HYPOGYNOUS : attached to the tip of the flower-stalk below the pistil, which is described as *superior*.

IMBRICATE : overlapping.

INDUMENTUM : covering of hairs or scales.

INFLORESCENCE : part of the stem bearing or composed of a number of flowers.

INTRORSE : turned inward.

INVOLUCRE : ring of bracts below the flower or a group of flowers.

LEAFLET : ultimate division of a compound leaf ; a trifoliolate leaf has 3 leaflets, e.g. *Butea* (p. 12), *Erythrina* (p. 63), a pinnate leaf, e.g. *Spathodea* (p. 136), more than 3 leaflets arranged along a common stalk (*rhachis*).

MONADELPHOUS : with the filaments of all the stamens joined into one.

MURICATE : rough with small hard projections.

NERVE : prominent vein of a leaf, etc.

OBOVATE : reversed egg-shape, *i.e.* broadest above the middle, with the more acute end basal, and length to breadth about 3 to 2.

ORDER : group of families : the sequence in botanical classification is Order (e.g. *Rubiales*), Family (e.g. *Rubiaceae*), Genus (e.g. *Gardenia*), Species (e.g. *Gardenia resinifera*).

OVARY : lower part of the pistil containing the ovules and developing later into the fruit containing the seeds (p. 123).

OVULE : potential seed within the ovary, usually requiring fertilisation in order to develop.

PANICLE : loose many-flowered much-branched inflorescence, e.g. *Jacaranda* (p. 93), *Kleinhovia* (p. 95).

PANICULATE : possessing or arranged in a panicle.

PAPILIONACEOUS FLOWER : " butterfly " flower of the type found in peas, beans and other members of the order *Leguminosae*, family *Papilionaceae*, e.g. *Butea* (p. 12), *Erythrina* (p. 63), *Gliricidia* (p. 87), *Pterocarpus* (p. 119), the outermost petal large and usually ascending (*standard*), the two side petals more or less parallel and free (*wings*), the two lower petals joined along their lower edge (forming the *keel*).

PAPILLOSE : covered with minute projections.

PARIETAL PLACENTATION : attachment of the ovules to the walls of a one-celled ovary.

PEDICEL : stalk of an individual flower.

PETAL : division of the corolla, the usually showy envelope of the flower between the calyx and the stamens ; in *Saraca* there is no corolla and what appear to be petals are petal-like (*petaloid*) calyx-lobes.

PETIOLE : stalk of a leaf.

PETIOLULE : stalk of a leaflet.

PINNA : leaflet of a pinnate leaf.

PINNATE : with simple leaflets (*pinnae*) arranged along two sides of a common stalk (*rhachis*), thus suggesting a feather (whence the term, derived from Latin *pinna* or *penna*, " feather ") ; an *imparipinnate* (or *odd-pinnate*) leaf, as in *Gliricidia* (p. 87), *Spathodea* (p. 136), ends in an odd terminal leaflet ; a *paripinnate* (or *abruptly pinnate*) leaf, as in *Cassia* (p. 19), *Saraca* (p. 130), ends in a pair of opposite leaflets without an odd terminal leaflet.

PINNATIFID : pinnately cut.

PISTIL (or GYNOECIUM) : central female part of the flower, later developing into the fruit ; typically it consists of the *ovary* or potential seed-box (see fig. on p. 123), containing the *ovules* or

potential seeds, surmounted by a *style* or upward prolongation of the ovary and ending in a *stigma*, the part which receives the pollen for fertilisation of the ovules ; sometimes the ovary has a stalk (or *gynophore*) as in *Crataeva* (p. 47), *Firmiana* (p. 79).

PLACENTA : part of the inside of the ovary to which the ovules are attached.

RACEME : inflorescence of indeterminate growth (*i.e.* not ending in a terminal flower which opens first) with the flowers on evident stalks (*pedicels*) arranged along a common lengthened main stalk (*rhachis*), the lower flowers opening before those nearer the tip.

RACEMOSE : arranged in a raceme.

RACHIS : see RHACHIS.

RENIFORM : kidney-shaped.

RHACHIS (RACHIS) : main stalk (axis) of an inflorescence or compound leaf.

RHOMBOID : shaped somewhat like a rhombus, which is a figure longer than broad with four equal sides.

SAGITTATE : like an arrow-head, *i.e.* enlarged at base into two pointed straight lobes.

SEPAL : division of the calyx (or outer envelope of the flower), just as a petal is a division of the corolla (or inner envelope).

SEPTUM : partition in the ovary.

STAMEN : one of the male organs of the flower, situated between the petals and the pistil, consisting of the *anther* or *pollen-box* mounted usually on a slender stalk (*filament*).

STAMINODE : a modified, sterile or abortive stamen or what from its position in the flower (corresponding to that of a stamen) appears to be one, having no anther ; *e.g.* in *Jacaranda* (p. 93).

STIGMA : pollen-receptive part, usually terminal, of the pistil.

STIPULES : appendages at the base of the leaf-stalk.

STYLE : narrowed upper part of the pistil supporting the stigma.

TORUS : tip of the flower-stalk carrying the sepals, petals, stamens and pistil.

TRIFOLIOLATE LEAF : compound leaf with only 3 leaflets, e.g. *Butea* (p. 12), *Crataeva* (p. 47), *Erythrina* (p. 63).

VALVATE : with parts touching along the margin but not overlapping.

VERSATILE ANTHER : anther balanced on the filament, and thus able to swing or turn on this, which is attached above the base of the anther ; a versatile dorsifixed anther contrasts with a non-versatile basifixed anther.

VERTICILLATE : whorled, arranged in a whorl.

WHORL : circle of organs, *i.e.* arising at approximately the same level on the stem.

ZYGOMORPHIC : irregular ; used when the parts of the corolla are unequal in size, differ in shape or do not spread regularly at equal distances, the corolla being divisible into equal halves along only one plane.

SOME SOURCES OF FURTHER INFORMATION

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CORRIGENDA

Page 3 *for* Raffil *read* Raffill

Page 37 *for* Vol. 18 *read* Vol. 17

Page 47 *for* (1827) *read* (1826)

Page 47 *add :*

Syn. *Crateva Roxburghii* R. Brown in Denham and Clapperton, Narrative of Travels, Appendix, 224 (1826)

Pages xi, 47-51, 145, 153, 156, 158, 160 *for* Crataeva *read* Crateva

Page 83 *for* Roth., *read* Roth,

Page 93 *for* avet. *read* auct.

Pages vii, ix, 156 and plate xxiii *for* Peltophorum Roxburghii *read* Peltophorum pterocarpum

Page 109 new heading :

THE COPPER-POD

PELTOPHORUM PTEROCARPUM (*DC.*) *Backer* ex K. Heyne, Nutt. Pl. Nederl. Indie, ed. 2, 755 (1927).

Syn. *Inga pterocarpa* De Candolle, Prodr. 2, 441 (1824)—*Peltophorum Roxburghii* (G. Don) Degener—*Peltophorum ferrugineum* (Decne) Bentham.

The epithet *pterocarpum* (meaning "with winged fruit" and alluding to the pods) has priority of valid publication over the other epithets (*inerme*, *Roxburghii*, and *ferrugineum*) applied to this tree and hence should be adopted.

Page 131 *for* hypenthium *read* hypanthium

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